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SUPPLEMENT TO THE  
ANNALS OF THE AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE,  
MARCH, 1891.

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HISTORY, THEORY, AND TECHNIQUE  
OF  
STATISTICS.

BY  
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TRANSLATED, WITH AN INTRODUCTION,

BY  
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PART FIRST:  
HISTORY OF STATISTICS.

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PHILADELPHIA:  
AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE.

1891.

## INTRODUCTION BY THE TRANSLATOR.

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IN presenting to the English public a work like the present a word of explanation seems in order. Professor Meitzen's work, "*Geschichte, Theorie, und Technik der Statistik*," represents the most complete statement of theoretical statistics, in the smallest compass, in the German language. Its translation therefore has appeared desirable as well on account of its form as its matter.

In regard to form, the work covers systematically the whole field of statistical theory, and thus furnishes the student an insight into the relation of the parts not to be gained by the consideration of special problems. In this respect the work represents a familiar habit of the German mind which has some signal advantages. We are apt in England and America to devote our study to special problems, and whole fields of research, long since systematized in Continental Europe, and there known, inaptly perhaps, as sciences, must be studied by the English student from treatises on special subjects, and he must in his own thought establish the connecting-links which bring about the harmony of the whole. If it be necessary to adduce instances of this fact let us consider for a moment the whole subject of public finance. An exhaustive treatment of the subject in English cannot be named, whereas the student of the subject at once recalls the names of German, French, and Italian writers who have devoted systematic treatises to it. The same is true of other topics, but notably so of that which we are now considering, statistics. It may be doubted whether the conception of statistics as a connected organic science is familiar even to those whose achievements in this field have been most honorable. Certainly no exhaustive treatise on the subject exists in our language despite the valued contributions made by English science to the subject. Hence the translation of the present work has been prepared partly with a view to the opportunity which it afforded for the comparison of German methods of thought with our own. No attempt will be made here to weigh the relative merits of each. Only in passing it may be observed that if the German plan tends to a superficial treatment of certain subjects in the endeavor to preserve the symmetry of the system, our own more special investigation tends to

deprive us of that insight into the general relations of things which illuminates and corrects our conception of special problems.

Now as respects the contents of the work, it may be remarked that the general interest in statistical results, and the increasing use of statistical figures in all kinds of scientific and popular discussion, are in marked contrast to the paucity of our scientific literature on the subject of statistics itself, which furnishes an additional motive for the present translation. In England we have the valuable works of Farr and Newsholme, and the Journal of the Statistical Society, in the United States the suggestive monograph of Prof. R. M. Smith on "Statistics and Economics," and the publications of the American Statistical Association, besides certain highly-prized official documents, and special studies from which the student of statistics may gather invaluable suggestions as to the statistical method and a keen insight which prevents his erring in the use of it. Nevertheless a complete formulation of the method and its processes, reinforcing that statistical instinct which is essential to all true work, is lacking in our literature. It is in part with the view of supplying this deficiency that the translation has been undertaken. Prof. Meitzen's clear and logical discussion of the processes of statistical argument must, we believe, be helpful to all who are confronted by such arguments and who feel the necessity of testing their reliability. If not the purpose, it is at least the result of the work that it furnishes the tests whereby we can readily ascertain whether a statistical argument can hold water. The Translator takes pleasure in acknowledging that in his own work he owes more to the inspiration of the present work than to any other treatment of the subject of statistics. To make the same opportunities accessible to the English public as far as may be possible is the aim of the translation. It is our sincere conviction that the study of statistical methods is not a merely theoretical but an eminently practical one, a necessary corrective of that false use of statistical results which is everywhere so abundant, and which, as we glean from the author's preface, is as much an evil in Germany as it is among us. It is hoped that the present work may accomplish something toward spreading more accurate conceptions of the possibilities and the limits of statistical argument.

Statistics, according to Prof. Meitzen, is a method of scientific investigation by means of enumeration of objects and the numerical comparison of the results of such enumeration. Hence they may be applied to any field whatever of human knowledge if the necessary conditions of the investigation are present. In other words, they are in no wise limited in their field of research. If scientific in character, however, they must possess distinct features in common wherever applied. It is the discussion of these common features, in short, of the method which forms the subject of the work. As a result, the treat-

ment is not only broader, but different from the usual treatment of statistics to be found in the foreign treatises on the subject, or in the monograph of Prof. Smith above mentioned. As a rule, these treatises deal in statistics as our knowledge numerically expressed of a group of phenomena variously designated as the state, society, human communities, etc. They contain therefore many statistical tables and the consideration of the conclusions to be drawn from the figures presented. The discussion of methods occupies a minor place. To Prof. Meitzen all this is explanatory matter, the method itself the essence of the subject. This view of the matter enables him to treat the subject in a smaller compass than is customary, and further to invest it with a general interest, not confining it to the needs of economists and sociologists simply, but furnishing precepts to all who may be engaged in the collection or use of figures for the purposes of argument or demonstration.

In conformity with this conception of statistics the first part of the work traces historically the growth of our knowledge, and processes of thought in using figures, up to the point where it has become possible for us to formulate connectedly the underlying principles, in short, to present a science of statistics which should be a science of method. To this end, it was highly desirable that the presentation of the subject should proceed in the historical form. The reader is able to follow in the light of this underlying conception with interest and intelligence what might otherwise appear a recital of insignificant details. The reader is forced to the conviction that the unity of statistical effort is to be found nowhere else than in the methods pursued by statisticians the world over. The unfolding of this conviction is purposed by the historical part of the work, and thus the reader is prepared for the better appreciation of the theoretical discussions which form the second part of the work.

The theory of statistics to Prof. Meitzen consists of the logical requirements of statistical proof. It is the discussion of these elements which forms the contents of the theory of statistics. The mental processes involved in the statistical statement and the statistical argument are carefully analyzed. This analysis proceeds to the very minute details, giving everywhere a complete statement of the nature which logical necessity demands that they should have in order to fulfil the conditions of correct statement or proof. Thus the model statistical argument is constructed. Its parts are analyzed, their true nature explained, the necessary connection between the parts displayed. Those who are familiar with this model argument are thus supplied with tests which, applied to the arguments presented to them, will enable them at once to discover their truth or falsity.

Practical statistics, the work of official bureaus, is not a matter of drawing inferences but of collecting material. Their work is largely

preparatory to statistical argument. Theirs is the technique of statistics. What demands does theory make upon them? The answer to this question forms the topic of the third part of the work. How should the bureaus conduct their work that the logical requirements of the model statistical argument be fulfilled? What light does the analysis of the statistical argument throw upon the workings of these bureaus? These are some of the questions discussed in this portion of the work.

The unity of the work rests, as is seen from the above, in the fundamental conception of statistics. The various parts of the work must be read in the light of this conception. The result is a harmonious grouping of the subject which well justifies for it the claim to the name of science. Whether or not this name is accorded to it is a question after all of small moment, provided that the continuity and organic union of the various parts be fully recognized.

If the translation of the work as a whole shall be useful in the formulation for science of the canons of statistical thought its purpose will have been accomplished. It is published in parts, I. History, II. Theory and Technique. Part II. is to be issued shortly.

Part I., the history of statistics, forms the contents of the present volume. It is, as above noted, preparatory to the theory which follows. The thread of development is carefully traced, and the reader is conscious of the real and important connection of events which follows from the author's fundamental conception of the essence of statistical science. In addition to this organic bond of union with the theoretical portion of the work, attention should also be called to the fact that the present volume contains one of the most complete surveys of statistical literature which is to be found anywhere. This feature must give it a special value for those seeking to inform themselves in this line, and render the book a useful work of reference.

With the kind encouragement of the author, and with the courteous permission of the publisher of the German edition,<sup>1</sup> the work is given to the English public.

THE TRANSLATOR.

<sup>1</sup>PHILADELPHIA, October, 1890.

<sup>1</sup> The original of the work has the following title-page :

Geschichte, Theorie, und Technik der Statistik, von August Meitzen, Dr. ph.,  
Geheimer Regierungs-Rath a. D., Professor an der Universität zu Berlin. Mit  
Tafeln. Berlin. Verlag von Wilhelm Hertz (Bessersche Buchhandlung), 1886.

## PREFACE OF THE AUTHOR.

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IN the following outline I have endeavored to give concise and systematic expression to a complete theory of statistics together with many ideas drawn from experience in practical work. I am conscious that it might have been desirable to devote to the subject a larger treatise and to include the discussion of the more important problems of social and political statistics. Extensive literary obligations and the pressing need of a basis for my lectures have led me to prefer an outline. Its brief, rather sketchy form seemed to me to possess certain advantages. No more of the customary apparatus of illustration has been introduced than was deemed necessary to dispel the slightest doubt as to the propositions stated. It is however my opinion that no text-book can ever fully replace for the student demonstrations with the use of the actual statistical material itself, and the consideration of questions arising from it.

The treatment is based throughout on the conception of statistics as a science of method. I hold this view to be correct, though I lay no greater stress upon it than is expressed in § 59. So far as the question of the position of statistics in the sphere of sciences does not concern the method nor the conception of statistics based upon it, it becomes merely a discussion of the definition of the word "science" and no essential condition of the theory is affected by the answer. No teacher of statistics can neglect to consider the requisites and some of the results of the statistics of population, of political organization and finance, of the soil and agriculture, of industry and trade, nor finally of national prosperity and morality. Whether these subjects taken together are to be called the "science," or whether they are to be regarded as the field of systematic statistics, is, as shown in § 90, of merely formal consequence. These subjects undoubtedly form appropriate material for connected treatment, and they are dependent on the same methods of investigation.

In a clearly-formulated conception of statistics as a science of method, I see the possibility of realizing an object which I consider essential, and which I desire above all. I hold it to be of the highest importance to demonstrate the logical character and logical rigor of statistics, and, if possible, to make these ideas common property. The

dream-like use which is made of statistics, but found in no other science, would, I am convinced, be most satisfactorily done away with by a theory which emphasizes distinctly the logical requisites and the logical limits of statistical knowledge. Conceive statistics in a scientific sense as one may, its true essence will always be the application and development of logic. Logic and statistics will both gain, in my opinion, when the consciousness that rigid laws rule in logic is brought to mind and kept alive by the direct practical problems of statistics. These are the fundamental thoughts of the work, and I hope that the mode of treatment, which in many places permits me to make suggestions only, may find lenient criticism.

AUGUST MEITZEN.

BERLIN, July, 1886.



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# PART I.

## THE HISTORY OF STATISTICS.

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### INTRODUCTION.

#### § 1. THE SUBJECT AND DEVELOPMENT OF STATISTICS.

WE understand as statistics somewhat superficially considered an extensive range of practical rather than theoretical problems. They are characterized by the effort to penetrate into the multitudinous phenomena of political and social life, of nature and civilization, by the enumeration of characteristic facts, by classification and explanation.

Among these characteristic facts are those relating to topography; to the population, and its classes in regard to social rank, age, religion, and occupation; to births, marriages, and deaths; to the state and its administration, its martial force, its property, its expenditures and receipts; to the territory in its physical aspects, its elevation, water-supply, climate, and fertility; to the agricultural, industrial, and commercial pursuits of the people, also to their resources and capital; and finally to their strength, their riches, their morality, their public-spiritedness, their social and religious culture, and to their enjoyment of life in its outward manifestations. All of these facts are to be ascertained in reference to actual status and to changes in the course of time.

The scientific interest in the solution of these problems is double in its character. It attaches in the first place to

the subject, and secondly to the process of investigation, to the method.

The results of such investigations are embodied in various branches of human knowledge. They consist of data concerning the quantitative and causal relations in which the objects observed have been found, and in which their reappearance may be expected. These results are sources of information for various sciences when other modes of investigation are inapplicable.

Scientific criticism, and therefore the theory of statistical science, concerns itself with the correctness of this mode of investigation and its development.

Objects and their relations are the material with which the theory has to operate. The material appears to be indefinite and unlimited, and to embrace all phases of actual existence. We must therefore know something about it in order to measure the scientific accuracy and reliability of the means adopted to investigate it. In the work of investigation, the methods are gradually more clearly understood, and thus we arrive at well-defined principles of research which have the value of scientific propositions.

The development of statistical science began, like that of all others, with a period of unconscious empiricism. Later the awakening scientific conception of the systematic investigation was so dominated by the mass of facts that methods secured for themselves only gradually a place in the system. The question is indeed still undecided whether the true contents of statistical science are certain groups of phenomena, particularly those of human communities (*Lebensgemeinschaften*), and the method simply the mode of securing knowledge in this field; or whether, on the contrary, the method with its logical and technical basis forms the true contents of the science, the objects serving simply as explanatory of the principles of method, or as examples of possible new problems.

From these preliminary considerations it is however

evident that the history of statistics cannot be an account of the results of enumerations obtained in the course of time for the solution of statistical problems. Its aim must be to point out the ideas which have arisen in the development of the science, and the range of ideas and experiences from which the demands made upon it by criticism have been finally answered. It must show systematically the character of the problems to which statisticians have devoted their efforts and the ideas underlying their solution. It must show the progress of the critical comprehension of the value of the results and demonstrate the growing clearness and definiteness of the theoretical and technical requirements. Undoubtedly the history of statistical science must be a history of statistical theory and technique.

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#### A. EMPIRICAL STATISTICS IN THE CLASSIC AND MÆDIEVAL WORLD.

##### § 2. THE OLDEST CIVILIZED NATIONS.

Problems, such as we to-day call statistical, were suggested and solved in the earliest periods of history. Practical necessity forced them upon the rulers of peoples on various occasions. Concerning numerous statistical undertakings definite testimony has been preserved.

Egypt: c. 3050, Arrangements for the construction of the pyramids; 2200, Maps of the country; 1400, Division of the land by Rameses II.; 600, Registration by the police of all heads of families (Herodotus II., 109, 125, 177).

Judea: Census of the population, estimated 1500 B. C. at c. 100,000 souls (Numbers III., 49-43); in 2030 B. C., at c. 3,800,000 (II. Samuel xxiv. 9; I. Chron. xxi. 5; xxviii. 24; xxiii. 3-5).

China: c. 2300, Description of the provinces by Yuking; 1200 B. C., Topographical officials (Ferd. Frhr. v. Richthofen, China. Berlin, 1877, Vol. I. p. 177).

Persia: Messenger mail, survey of roads, assessment of real estate tax in Ionia (Herodotus III., B; V., 49, 52; VI., 42; VII., 21).

(Moreau de Jonnés, *Statistique des peuples de l'antiquité*, Paris, 1851. M. Duncker, *Geschichte des Alterthums*.)

### § 3. GREECE AND ROME.

The distribution of real property, of classes of citizenship, of military and naval service, of taxes and public burdens, and privileges, was arranged in many Greek states in a manner which presupposed many inquiries of a statistical nature.

850. Lykurgus divided the territory of Laconia into 39,000 portions, assigning to the Spartans 9000 portions and to the Lacedæmonians 30,000 portions.

594. Solon's tax census divided the people into four classes according to the supposed returns from their property measured in wheat, and imposed a poll tax on the alien residents.

309. A census in Athens showed a population of 21,000 citizens, 10,000 alien residents, and 400,000 slaves.

(Boeckh, *Staatshaushalt der Athener*. 2d Ed. 1851. Büchschütz, *Besitz und Erwerb im griechischen Alterthum*. Halle, 1864. Hermann, *Griechische Staatsalterthümer*, 1875, 98, 7. Clinton, *De Græciæ magnitudine et frequentia*, in the *Fasci Hellenici*, Krüger's edition, p. 391. M. Duncker, *Die Hufen der Spartiaten*. *Monatsbericht der Berliner Academie* 7, 2, 1881.)

In Rome periodical enumerations of the population as well as investigations of property of an exactness not attainable in recent times existed from the time of Servius Tullius. There were also after Augustus surveys of roads and districts, assessment of real estate taxes in Italy and the provinces, and later detailed official state handbooks.

550. The constitution of Servius Tullius distinguishing six property classes.



435. The first census in the presence of the Censors, which in the following 470 years was repeated 69 times. Births were reported in the temple of Juno Lucina, puberty in that of Juventus, and deaths in that of Libitina.

c. 90 A. D. Hygin's treatise on surveys for real estate taxes (in *Auctores gromatici* of Lachmann and Rudorff I., p. 113).

c. 290. *Tabula Peutingerana* (Philippi d. t. P. Bonn, 1876).

c. 330. *Itinerarium Antonini* (Tobler's edition, 1863).

404. *Notitia omnium dignitatum administrationumque* (Boeking's edition, Bonn, 1839).

(Niebuhr, *Römische Geschichte* I. 619, II. 78. De la Malle, *Économie politique des Romains* 1840. Theod. Mommsen, *Staatsrecht der Römer* 1876, I. 207, II. 304. Die amtliche Bevölkerungsstatistik im alten Rom, Hildebrand's *Jahrbuch für Nationalökonomie und Statistik*, 1866, Vol. I. p. 82.)

#### § 4. THE MIDDLE AGES.

Taxes, military service, tithes, and customs duties alone gave rise to inquiries and records of some degree of a statistical character. Of those which have been preserved, the most important are the land registers of different countries showing the number and obligations of the holdings, something in the same way as a cataster.

807. *Caroli magni memoratorium* and

808. *Brevis capitulorum*, concerning military service (*Monum. Germ. leg. Sct.* II., Tom I., Berolini, 1880, pp. 134, 137).

c. 830. Al-Mamum, *Description of the provinces of the Khalifate* (Fallati, *Einleitung, in die Wissenschaft der Statistik*. Tübingen, 1844, p. 125).

950. List of judicial districts and provinces of the Emperor Constantin Porphyrogeneta (*Ibid.*).

1088. *Domesday book* of William I. (Gneist, *Englisches Verwaltungs Recht*, 1876, I. p. 116).

1231. Land Register of Waldemar II. (Lappenberg, *Script. rer. Danic.* 1792).

1241. Inventory of Emperor Frederick II. of the crown estates in Sicily (v. Raumer, *Hohenstaufen* 1841, II. 409).

1327. Katasto of Duke Charles of Calabria (Quadri, *Storia della Statistica*, Venice, 1824).

1337. Landbuch der Neumarkt (Gollmert's edition, 1862).

1358-67. Landbuch für das Fürstenthum Breslau-Neumarkt (Stenzel, 1842, in the *Bericht des historischen Sektions der schlesischen vaterländischen Gesellschaft*).

1375. Landbuch der Mark Brandenburg (Fidicin's edition, 1856).

1377. Poll tax in England under Edward III. and Richard II. (Pelgrave, the *Parliamentary Writs Collection*, London, 1827).

1442. Salt tax in Sicily under Alphonse I (Galanti, *Descr. geogr. et statistica delle Sicilie*, 1787).

1460. De ritu, situ, et moribus Germaniæ of Pope Æneas Sylvius Piccolomini.

1515. Machiavelli, *Ritratti della Francia et della Alemagna*.

## B. FROM THE BEGINNING OF SCIENTIFIC STATISTICS TO THE YEAR 1750.

### I. COMPARATIVE POLITICAL STATISTICS (ACHENWALL'S STATISTICS).

#### § 5. STATISTICAL NEEDS OF THE MODERN STATE.

All science is based on a practical art, but it soon oversteps these limits in the search for the general connection of things. Thus it becomes a system, and promotes in turn practical purposes by means of systematic principles which extend the limits of our general knowledge. It is

at first simply a search for a system, for a logical conception, and is developed and completed gradually.

In the beginning, statistics considered as its material the most urgent need of the period, namely the knowledge of the state, and as its method comparison, without, however, possessing an exact sense of proportion nor a distinct consciousness of the necessity of measurements.

The stimulus came from the remarkably rapid transformation of mediæval society into the form of the modern state. At the end of the 15th century the general longing for order and security gave monarchy a rapidly-increasing power. An experienced bureaucracy took the reins of government, a standing army crushed out every resistance to the measures of the courts and the administration. The nobility came to prefer court life, official position, or the management of their large estates to the ruinous feuds of earlier periods. Fiscal necessities gave rise to the ideas of "Kameralistik" and "Wohlfahrtspolizei" (productive administration of public property, and police regulations for the promotion of general prosperity). Without a knowledge of the state of the country, its resources could not be developed.

The totally changed character of foreign relations was another factor. In the circle which surrounded the monarch there was a possibility of rapid resolution and a dangerous secrecy hitherto unknown. Noiseless preparations and agreements could turn the whole power of the state suddenly on some unforeseen aim. The intriguing state policy of Italy, there a hundred years old, became the common property and the common danger of Europe. Modern diplomacy arose and with it a fabric of distrustful mutual observation. The key to success was cautious, considerate judgment, based on the best attainable information as to one's own military, financial, and political resources, and those of other powers.

No wonder therefore that writers of this period conceived the idea of investigating scientifically the elements

of strength and power of existing states, and making this the subject of instruction, though the ways and means of such investigation might be new and difficult.

#### § 6. FUNDAMENTAL WORKS.

The first typical work in this field was the *Cosmographia* of Sebastian Muenster (born 1489 at Ingelheim, died 1552 at Basle, a Franciscan, but after 1529 Protestant professor at Heidelberg and Basle). A portion of the work appeared in 1536, the whole in 1544. The 1st book describes the world according to Ptolemy; the 2d, Ireland, England, Spain, France, and Italy; the 3d, Germany; the 4th, the rest of Europe; the 5th, Asia; the 6th, Africa. Maps are given for all known countries and they are treated systematically under the following heads: boundaries, divisions, principal towns; history; state organization, rulers, nobles, estates, army, military capacity, church relations, laws, customs and manners; and in detail the chief cities with their wealth and trade.

In 1562, Francesco Sansovino (born 1521 at Rome, died 1586 at Venice, lawyer and author) followed with his work: *Del governo ed amministrazione di diversi regni ed republiche libri XXII*. It treats of France, Germany, England, Spain, Turkey, Persia, Tunis, Fez, Poland, Portugal, ancient Rome, modern Rome, Switzerland, Ragusa, Sparta, Genoa, Athens, Lucca, Venice, Nuremberg, and Utopia, *i. e.*, Plato's republic, and gives in a small compass a concise and elegant description of their public law and their customs.

In 1589 appeared from the pen of Giovanni Botero (born at Bene, died 1608, secretary of Cardinal Charles Borromeo, tutor of the children of Duke Charles Emanuel of Savoy, and an experienced diplomatist), *Le relationi universali divisi in quattro parti*, or in the Latin edition, *Relationes universales de viribus, opibus et regimine principum Europæ, Asiæ et Africæ*. The modest volume

with rich contents gives estimates in figures of the areas, revenues, taxes, military strength, and the importance of the commerce of the various countries.

In 1614 Pierre d'Avity, Seigneur de Montmarin (born 1572, died 1635, serious and learned author in usum delphini), wrote under the initials D. V. T. Y.: *Les états, empires et principautés du monde, représentés par la description des pays, moeurs, des habitans richesses des provinces, les forces, les gouvernements, la religion et les princes, qui ont gouverné chacun État*. Volume I. contains the account of a circumnavigation of the globe with the description of Asia, Africa, and America; volumes II.-IV. treat of Europe with exact and useful data.

All these books appeared in numerous editions and in several languages.

In 1626 the book-dealers Elzevir in Leyden, celebrated for their editions of the classics, began the publication of the so-called *Respublicæ Elzevirianæ*, consisting of 34, and later 60 descriptions of single states by distinguished statesmen such as Jean de Laet (director of the Dutch West India Company, died 1649), Contarini, Josias Simler, Janotti, and others.

#### § 7. STATISTICAL LECTURES AND COMPILATIONS.

Statistical studies were first introduced into the University curriculum in 1660 at Helmstedt, by Hermann Conring (born 1606 at Norden, died 1681, well-known medical and physiological authority, physician in ordinary to several princes, professor of the law of nature, and distinguished polyhistor). His lectures were published in 1668 by Poepping, 1675 by Ph. Andr. Oldenburger, and 1730 according to corrections left by Conring himself, by Goebel. His data are drawn chiefly from Botero, the *Respublicæ Elzevirianæ*, and J. A. de Thou, *Historiæ sui temporis* (1606-1614). Conring requires not only a description of the *ὄντι*, as he says, but also of the causal

connection, *διότι*, of Aristotle distinguished in time and space. He groups the causes according to the four Aristotelian principles; the *causa materialis*, the people and its energy, the land and its production; the *causa finalis*, prosperity and its means; the *causa formalis*, the form of the state and the mode of government; and the *causa efficiens*, the actual ruler, the officials, and the estates with their auxiliaries and resources (V. John, *Geschichte der Statistik*, 1884, Part I. p. 52).

Lectures on the model of Conring's were read in the 17th century by Oldenburger (Geneva), Herz (Giessen), Bose, Sagittarius, Schubart (Jena), and Beckmann (Frankfort-on-the-Oder). In 1673 the last-named wrote his *Historia orbis terrarum geographica et civilis*.

Thomasius in Halle begins in 1694 the list of the so-called "Kameralisten," most of whom besides teaching the science of administration and finance delivered the customary statistical lectures. Among their publications that of Everard Otto (in Utrecht), *Primæ lineæ notitiæ Europæ rerum publicarum*, 1726, is most widely known. By far the best work of this period is that of Thomas Salmon, *The present state of all nations*, 1724.

#### § 8. GOTTFRIED ACHENWALL.

The range of ideas represented in these works received from Gottfried Achenwall a generally acknowledged scientific form. He is therefore called the father of statistical science.

Achenwall (born 1719 at Elbingen, died 1772), a pupil of Schmeitzel in Jena, began in 1746 statistical lectures at Marburg, and wrote in 1748 the essay "*Vorbereitung zur Staatswissenschaft der europäischen Reiche*" upon being called to Göttingen. This work became later the introduction to his "*Abriss der neusten Staatswissenschaft der heutigen vornehmsten europäischen Reiche und Republiken*" (later *Reiche und Völker*), published in 1749.

In this introduction he uses for the first time the word "Statistik" (statistics, statistical science).<sup>1</sup> Up to this time the word had been merely suggested by Philander von Sittenwald's *statista*, one versed in the knowledge of the state, or by the adjective use, *rationes statisticae*, by Oldenburger, 1668, *bibliotheca statistica*, by Thurmann in 1701, and the *collegium statisticum* of Schmeitzel. Achenwall derives the word from the Italian, *ragione di stato*, practical politics, and *statista*, statesman.

Concerning the definition of statistics, and its scientific method of investigation, Achenwall says: "When I consider a single state, I discern a vast number of things actually to be found therein. Among them are some which concern obviously its prosperity either in obstructing it or contributing to it. Such things we might call 'Staatsmerkwürdigkeiten' (the remarkable things of the state). The totality of these 'Staatsmerkwürdigkeiten' of a kingdom or a republic, makes up its constitution in the broadest sense, and the account of such constitutions of one or more states is 'statistik.' Its final object is to gain political wisdom by means of knowledge of the various states. The internal interests of the state, the means of increasing its wealth, of stimulating population and riches, of promoting science, industry, and commerce, and of improving the defects of the constitution, may be treated separately for each particular state. The external interests of the state, whether it can dispense with foreign allies or must seek them, whether it has much or little to fear from foreign powers, require comparisons of the state with all other states, and cannot therefore be understood without a knowledge of these foreign powers."

<sup>1</sup> M. Block (*Traité de la statistique*, p. 9, note) tells us: "It seems to have been Brion de la Tour who employed for the first time the word 'statistique' in France. At least he published in 1789 *Tableau de la population de la France*, avec citation des auteurs, au nombre de soixante douze qui ont écrit sur cette partie de la statistique. According to Bachaumont, 'Mémoires secrets,' the economists employed the word earlier. It was Sinclair who introduced the word into England." (Translator's note.)

Achenwall, however, treats only Spain, Portugal, France, Great Britain, the Netherlands, Russia, Denmark, and Sweden. He gives a careful picture of each, of land and people, in seven distinct groups of questions: 1. The literature and sources of information. 2. The state, its territory and the changes of the same. 3. The land, its climate, rivers, topography, divisions, abundance or scarcity of products. 4. The inhabitants, numbers and character. 5. The rights of the rulers, the estates, the nobility, and the classes of the inhabitants. 6. The constitution of the court and the government, laws, and administration of churches, schools, and justice, industry, home and foreign commerce, currency, finances, debt, army and navy. 7. The interests of national life and politics, as well as the outlook for the future.

This conception of the matter which statistics treats coincides, it is obvious, with that of Conring and Muenster. Achenwall limits his researches to the collection of material from the existing literature, does not criticise either the sources of the information or the proofs of the causal connections, but is satisfied with very general political, economic, and ethical reflections. Nevertheless the short narrative is a model of conciseness, diligence, and lucidity. The work found such general recognition that it was translated into all languages. As a consequence, all nations received the word statistics, and with it at the outset that conception of statistics which was supported by Achenwall.

## II. OFFICIAL STATISTICS (BÜSCHING'S STATISTICS).

### §9. SCIENTIFIC DEMANDS LEADING TO OFFICIAL STATISTICS.

The literary treatment of the data relating to the state which has just been considered was far from excluding the idea that an insight into the state of social and political affairs might be obtained by the coöperation of the official



organs in the collection of information on sound scientific principles. The idea appeared as early as the period of the Reformation.

Jean Bodin (born 1530 at Angers, died 1596, lawyer and professor of public law at Paris) expresses it in his "*Six livres de la républiqué.*" He pleads for the reinstatement of the Roman census as an adjunct of the police power, as a safeguard against the arbitrary and usurious demands of the tax farmers, and finally as a means of information as to the number and position in life of the population. Similar inquiries are desired by Jac. Franc. Lottini (ambassador of Venice at the court of the Emperor) in his essays on the *Tesoro publico*, 1600.

A remarkable theoretical and technical insight into the statistics of population is shown by Georg Obrecht (born 1547, died 1612, professor at Strassburg) in "*Fünf unterschiedliche secreta politica*" published in 1617. In the essay "*Eine sondere Polezei-Ordnung und Constitution, etc., wie die gemeine Wohlfahrt zu vermehren*" he proposes continuous statistics of population based, to be sure, on very extended inquisitorial privileges of the government organs. Lists of legitimate and illegitimate births, marriages, deaths, and guardianship, as well as the ages of the people in groups of three years, could be obtained by a permanent combination with the collection of taxes. Data concerning moral deportment and for convicts concerning reformation and repetition of offences could be obtained also. His propositions are accompanied with explanations as to their application which approach a legal ordinance in clearness and exactness, and contain schedules and estimates of probable cost. These all reveal a wonderfully-clear conception of the decisive factors in practical statistics. A second essay gives the project of a law to authorize the fiscus to establish a life insurance and pension institution (W. Roscher, *Geschichte der National-ökonomie in Deutschland*, 1874, p. 152).

Various statistical inquiries were demanded also by :

1623. Christoph Besold (born 1577, died 1638, professor in Tübingen) in *Synopsis politicæ doctrinæ*.

1656. Veit Ludw. von Seckendorf (born 1626, died 1692) in "Deutscher Fürstenstaat."

1674. Joh. Heinr. Bœcler (born 1614, died 1672, professor at Strassburg and Upsala) in *Institutiones politicæ*, II. 10.

c. 1700. Gottfr. Wilh. Frhr. von Leibniz (born 1646, died 1716) in a project for the Saxon Society of Science. (Ed. Bodemann in *Preussischen Jahrbücher*, 1884, Vol. 53, p. 378.)

#### § 10. COMPLETED OFFICIAL INVESTIGATIONS.

Among the first official undertakings in which material was collected and treated statistically were the following :

1575. Seventy-five questions of Philip II. directed to the prelates and corregidores of Spain, concerning the state of their districts. The answers were classified for the king's use (L. von Ranke, *Fürsten und Völker*, I. p. 120).

1581. Nicol Froumenteau, *Secret des finances*, and

1586. Et. Pasquier, *Recherches de la France*, both from the books of the state chamber of accounts.

1597-1610. Sully (born 1560, died 1641) presented to Henry IV. official statements as to the state of the finances and the army, and proposed in 1609 a plan for a comprehensive cabinet d'état et de guerre (*Mémoires des sages et royales oeconomies d'estat de Henry le Grand*, 1634. Petitot, *Collection des mémoires relatifs a l'histoire de France*; Series II., Vols. I.-IX., Paris, 1820).

1622, 1639, etc. Registration of local citizenship every twelve years in Würtemberg.

1637. *Status regiminis Ferdinandi* in Austria.

1645 in Brandenburg, 1647 in Hesse, registration of the tax collection bureaus, the peasant proprietors, and men of other occupations.

1665. Colbert's statistics of trade.

1675-1725. The so-called États, numerous semi-official public documents.

1679. Almanach royal de la France.

1684. Annual accounts of births, deaths, and marriages in all sections of Brandenburg.

1688. Louvois, Dépôt de la guerre.

1696 the English Parliamentary Papers first appear.

1697 the first enumeration of cattle in Saxony.

1699 Louis XIV. required reports from the general intendants. The dissimilar and deficient returns are used by Count Boulainvilliers, 1727, in his *État de la France*.

In 1719 Frederick William I. of Prussia began the semi-annual tables of population, occupations, artisans, domestics, houses, real estate holdings in the city and country, taxes, city finances, etc., which were arranged at a central bureau. Later these tables were made every three years (R. Boeckh, *Geschichtliche Entwicklung der amtlichen Statistik des preussischen Staates*, 1863).

## § II. FREDERICK THE GREAT.

King Frederick II. of Prussia regarded statistics from a high scientific standpoint as a necessary methodical observation and a continuous test of the efficacy of administrative measures. He extended the scope of the tables, by including data relating to social state, nationality, age, deaths by months, and causes of deaths in 56 classes, specifications of the agricultural population and property according to numerous classes, improved and settled territory, industrial pursuits with 460 classes, linen and woollen industry, mining and smelting. Beginning with 1747, detailed reports of trade distinguishing 70-100 different wares were prepared; beginning with 1748 annual enumerations, population, 1751, of cattle were undertaken and continued regularly after 1770. In 1772 a general table of factories was introduced, 1778 seed and harvest were reported, and

1782 the number of ships. Besides these there are numerous reports drawn from the operations of the tax, justice, military, and school departments. In 1750 werè commenced the triangulation of the state and the preparation of the chart of the general staff, by the Field Marshal and Colonel von Schmettau. The statistical details were collected in general outline tables which the king carried with him on his journeys. His personal examination, his interest in the collection and his use of the results, his severity, his acuteness, and his remarkable topographical knowledge secured for these reports greater exactness than might have been expected considering the difficulties to be overcome. The universal obedience to the royal wish was naturally an important factor in obtaining correct returns.

(Boeckh, see § 10—Meitzen, *Der Boden und die landwirtschaftliche Verhältnisse des preussischen Staates*, 1868. Part I. p. 10.)

#### § 12. ANTON FRIEDERICH BÜSCHING.

The systematic publication of the details of official statistics owes its origin to Anton Friederich Büsching. By this publication the use of the facts in scientific study became general, and a mass of matter preserved which might be of much value in later investigations.

Büsching (born 1724 at Stadthagen, teacher in Copenhagen and St. Petersburg, 1754 professor at Göttingen, 1766 director of a Gymnasium at Berlin, died 1793) wrote 1754-1792 the first ten parts of his "*Neue Erdbeschreibung*," which however was not completed until 1807 by Sprengel and others. In 1758 he wrote a "*Vorbereitung zur gründlichen und nützlichen Kenntniss der geographischen Beschaffenheit und Staatsverfassung der europäischen Reiche*," in which he does not, like Achenwall, describe single states, but seeks rather to compare the different states in the main phenomena of political life.

In 1767 he founded "das Magazin für Historiographie und Geographie," which appeared in 23 parts down to 1793. Here were collected statistical figures from numerous German and other lands, so that it may be considered as the first periodical work on statistics.

The importance of Büsching as compared with Achenwall, is chiefly that the former instead of indulging in general reflections and observations, and being content with the totals, directed his attention to the details. This led to a careful examination as to the completeness and correctness of the data, and promoted, by the scrutiny of their origin and arrangement, the progress of critical methods.

### III. STATISTICS OF POPULATION (SÜSSMILCH'S STATISTICS).

#### § 13. CONNECTION WITH THE CHURCH REGISTERS.

In a limited field the statistical details had attracted at an early date the attention of investigators. These studies had for their subject the typical relations of human life and death, and extracted the materials almost exclusively from the church registers.

Regular and continuous registration of births, marriages, and deaths was first introduced, as far as is known, in Augsburg in 1501, and then in several German cities. It was prescribed generally but ineffectually in 1524 by the Synod of Séez in Alençon, where the Huguenots were numerous. In 1533 the Brandenburg-Nürnberg evangelical Church Ordinance required baptismal and marriage registers, and that of Liegnitz in 1534 baptismal records. Henry VIII. in 1537 and Francis I. in 1539 ordered church registers to be kept. In Breslau registers were ordered in 1542 for marriages, 1570 for baptism, and 1599 for deaths, the same in Brandenburg in 1573, and in the Electorate of Saxony in 1580 (A. L. Richter, *Die evangelischen Kirchen-Ordnungen des 16. Jahrhunderts*, 1846. E. Rehnisch,

Graetzer, Halley, und Neumann, in *Göttinger Gelehrten Anzeigen*, 1883, p. 1576).

In London baptismal records were introduced in 1550, and in consequence of the plague, death registers in 1592. From 1629 women were employed to inspect the dead. They were required to estimate the probable age, and to register this with a statement of the illness or accident causing death. The results were published weekly.

John Graunt (born 1620, died 1674, shopkeeper, musician, member of the Academy) compared and criticised these figures for the years 1629 to 1661 in his work "Natural and political observations upon the bills of mortality, chiefly with reference to the government, religion, trade, growth, air, diseases, etc., of the city of London, by Captain J. G." It was presented in 1662 to the newly-founded Royal Society. Graunt comes to the surprising result that the sexes are nearly equal in numbers, that herein war and pestilence exercise no appreciable effect, that 14 boys are born for every 13 girls, and that the ratio of births to deaths is quite uniform. He calculates that of 100 persons born, 36 die in the next 6 years, 24 in the next decade, 15 in that following, and then successively 9, 6, 5, 4, 2, and 1, and demonstrates finally that from this ratio of deaths the number of living persons could be calculated (G. F. Knapp, *Theorie des Bevölkerungswechsels*, 1874, pp. 57 and 121. John, see § 7). Graunt's discoveries excited the greatest interest, and particularly the large population which he ascribed to London aroused the jealousy of Paris and led to further discussions and investigations.

William Petty (born 1623, died 1687, physicist, physician, the friend of Hobbes) in particular espoused the cause. His chief work of 1679 is "Political Arithmetick, or a Discourse concerning the Extent and Value of Lands, People, Buildings; Husbandry, Manufacture, Commerce, Fishery, Artizans, Seamen, Soldiers; Public Revenues, Interest, Taxes, Superlucration, Registries, Banks; Valuation of Men, Increasing of Seamen, of Militia's, Harbors,

Situation, Shipping, Power at Sea, etc. As the same relates to every country in general, but more particularly to the Territories of His Majesty of Great Britain, and his Neighbors of Holland, Zealand, and France." He complains in it of the lack of figures based on actual enumeration and says of his method, "I have taken the course to express myself in Terms of Number, Weight, or Measure, to use only Arguments of Sense and to consider only such Causes as have visible Foundations in Nature." His posthumous works were published in 1690 and 1699 by John Williamson.

In 1696 Gregory King calculated from the hearth tax, assessed in 1690 on 1,319,215 houses, the population of England at five and a half million souls. Numerous similar calculations are to be found in the Philosophical Transactions of this period.

#### § 14. EDMUND HALLEY'S MORTALITY TABLES.

In order to prove that it was superstitious to ascribe any special importance to the seventh and ninth year for the expectation of life, the prebendary Caspar Neumann of Breslau collected from the parish registers of the city, in the years 1687-91, notes of 5869 deaths, from which he counted those falling in the fateful years and those lying between. These figures and the notes on which they were based came into the possession of the Royal Society in 1692, as it appears through the intervention of Leibnitz. The Society asked Halley for an expression of opinion on them.

Edmund Halley (born 1656, died 1742), who made at St. Helena in 1676 a catalogue of the stars of the southern heavens, and calculated in 1681 the comet bearing his name, made in 1693 a report which was printed in the Philosophical Transactions of the Royal Society for that year (Vol. XVII., Nos. 196 and 198) under the title "An Estimate of the Degrees of Mortality of Mankind, drawn from curious Tables of the Births and Funerals at the

City of Breslaw; with an Attempt to ascertain the Price of Annuities on Lives." In this he gives in the form shown in Appendix I., Halley's mortality tables, which were the earliest apart from the figures given by Graunt.

Though his methods of calculation even with the light thrown on them by the papers preserved by the Royal Society are obscure, his figures are gained essentially by eliminating from Neumann's figures apparent accidental variations, and developing from the deaths at the various ages a general scale. On the basis of the ages of those who die he shows how many of a certain number, born in a given year, will die or survive in each succeeding year. From this he calculates for life insurance the average expectation of life at each age, and for the statistics of population the probable number of the population of a given district from the number of births in a year.

However, Halley erred in the hopes which he expressed of the reliability of such calculations from his figures. He himself limits their applicability, in pointing out that they would not be exact for cities such as London and Dublin, on account of the continual changes of trade. Though he speaks of an excess of births over deaths he does not notice that his figures apply only to a stationary population, which neither increases nor decreases in the course of a human life. If the yearly increase of population in Europe be assumed to be on an average one per cent., it is evident that those who die at the age of 100 would come from a smaller population, in fact about 2.7 times less, than that of the children of one year. The percentages, therefore, which are calculated from the various ages, from the deaths of one year or of several, without consideration of the increase of population, must undoubtedly be incorrect somewhere in the table, either at the beginning or at the end. According to Halley, the average length of life is only about 31 years, whereas counting 1 per cent. annual increase it would be 37.5 years.

In how far the mode of calculation which Halley em-



played is original with himself we do not know. His contemporaries recognized him as the founder of this method of calculating mortality tables, which however is only applicable to a stationary population (Knapp, p. 61, see § 13).

#### § 15. ANNUITY AND LIFE INSURANCE INSTITUTIONS.

Life insurance was known in the Middle Ages for persons going on sea voyages or pilgrimages. Out of it grew a species of wager on one's own or another's life, which as being questionable was forbidden in 1570 in Holland, in 1598 in Genoa, in 1681 in France, though permitted in England up to 1773.

During the 17th century the games of hazard grew into prominence. In 1660 lotto was invented; 1634-37 was the period of the tulip swindle in Holland; and in 1653 France accepted the project of the physician Lorenzo Tonti, to contract State debts by selling annuities in the tontine form, whereby the income of the dying accrued to the surviving. The probable duration of the annuities having been calculated too short, the state drew little profit from them, and supplied their place with lotteries (Bender, *Die öffentliche Glückspiele*, 1862). In 1657 Ch. Huygens, and in 1660 Format and Pascal calculated the probabilities in games of chance. In 1670 Jean de Witt (executed 1672) formulated the principles for annuity life insurance from the death registers of Dutch cities. In 1698 the first life insurance institution was founded in London on Ascheton's plan, and in 1699 the Society of Assurancy for Widows and Orphans. Both existed up to 1730. In 1706 the Amicable or Perpetual Assurance was founded in London, which in 1866 ceded its business to the Norwich Union; 1721 saw the foundation of the Royal Exchange and the London Assurance Company, both of which exist at present.

In 1713 there appeared by Jac. Bernoulli (born 1654,

died 1705, professor in Basel) "*Ars conjectandi*," a scientific demonstration of the theory of probabilities.

More exact calculations of mortality were furnished in 1724 by de Moivre (born 1667, died 1754, Huguenot, London) *Annuities of lives*; 1737 to 1748 by W. Kerseboom (born c. 1691, died 1771, Hague, treasury official) in various essays in which as he says he follows Halley's method, but whose defects he points out (Knapp, p. 60, see § 13); also in 1740 by Nicol Struyk, who for the first time calls attention to the different mortality of men and women.

#### § 16. JOHANN PETER SÜSSMILCH.

The investigations of the course of human life, which had hitherto been carried on in England, Holland and France from mathematical, political and industrial points of view, were taken up first in Germany by Süssmilch, who placed them under the more comprehensive and more ideal standpoint of scientific statistics.

Joh. Peter Süssmilch (born 1707 at Berlin, died 1767, military chaplain, Oberkonsistorialrath, member of the Academy) wrote "*Betrachtungen über die göttliche Ordnung in den Veränderungen des menschlichen Geschlechts aus der Geburt, dem Tode, und der Fortpflanzung desselben erwiesen*," dated 1741, on the march to Schweidnitz, and provided with a preface by Chr. Wolff. (The same in 1742.)

He rests his work on the authority of Graunt, Petty, King, Arbuthnot, Derham, Niuwentyt, and upon the new and rich material for the Prussian provinces. For the regularity of the movement of the population of middle Europe he calculates averages which are substantially correct to the present. In these results he perceives a providential ordinance (Genesis i. 28), contrary to which mankind cannot act with impunity. He proves the birth of 21 sons for 20 daughters, and the equality of the sexes at the age of marriage, from which he derives the

command of monogamy. The higher order of things reveals itself further in the fact that in each year about the same number die as in every other, and this applies alike to children, youths, men, and old men and to the two sexes alike, that sickness and epidemics do not essentially alter these relations, and also that multiple births, stillbirths, and accidents have certain numerical relations. For the order of decease he takes Riciotti's estimate of 1000 millions as the population of the globe, and describes it under the metaphor of a body of passing troops. The first detachment of children from birth up to 5 years of age consists of something over 108 millions, those of 5 to 10 years 65, those from 10 to 15 years 62, those from 15 to 20 years 60 millions, etc. Always, however, when 10 die 13 newly-born begin their course, and each age furnishes a fixed contingent of deaths.

He does not doubt that the order thus created by the will of God can be disturbed by outward circumstances and wilful acts. He finds a proof of this in the fact that in cities one person dies out of every 25 to 32; in the country, however, one out of every 40 to 45. He censures, therefore, with earnestness all unnaturalness, immorality, and luxury of life. In want, waste, wars, and worthless constitutions, he perceives a source of unnatural and unsound conditions whose prevention by all legitimate means is the duty of the state. Here he stands upon the standpoint of the most enlightened politicians of his time. The second edition of 1761 recommends expressly the emancipation of the person and the real property of the peasant, the abolition of feudal burdens, the cultivation of wild lands, protection against filling up with sand or other waste, proper distribution of the field holdings, renting of the public domains, the use of oxen instead of horses, fruit and bee culture, encouragement of manufactures and trades, especially such as require much labor, encouragement of commerce by reliable wares, reasonable prices and freedom from burdensome taxes. To work in law

and ordinance from the points of view shown to be beneficial for the welfare of the population, is the occupation of the ruler and his God-appointed duty.

Süssmilch does not discuss the mathematical basis of the order of mortality, although he is familiar with the standpoint. He emphasizes the necessity of proper calculations for annuities and life insurance.

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### C. DEVELOPMENT OF UNIFORM SCIENTIFIC STATISTICS.

#### I. BROADER VIEWS AND PROBLEMS.

##### § 17. THE SCHOOL OF ACHENWALL.

About the middle of the eighteenth century the various lines of statistical activity which had appeared found almost contemporaneously distinguished representatives—men who systematized and broadened the field. These men belonged exclusively to Germany and lived in Göttingen and Berlin, not without personal relations to each other, yet without scientific connection or coöperation. Each had a circle of pupils and successors, and these in turn remained for a long time in the traditional ways.

Achenwall was able to bring his fifth edition of 1772 in accord with the latest data. The sixth was edited by A. L. v. Schlözer in 1781, the seventh in 1790 by Sprengel.

Among the works of the school may be named—

1757. Reinhard, *Einleitung der vornehmsten Reiche und Republiken in Europa und Africa.*

1761. Baumann, *Kurzer Abriss der Statistik.*

1772. Meusel, *Lehrbuch der Statistik.*

1773. Gatterer, *Ideal einer allgemeinen Weltstatistik* (with a history of the literature).

1782. v. Hertzberg, *Réflexions sur la force des états*, and

1785. Sur la population des états en général et sur celle des états Prussiens en particulier.

1787. Antonio Mont Palau, Description politica de las soberanias de Europa.

1787. Ed. Zimmermann, Political Success of the present state of Europa.

1792. M. de Beaufort, Grande portefeuille politique.

Grundrisse der Staatskunde, were written in 1792 by Lüders, in 1793 by Sprengel, in 1796 by Luca, in 1797 by Fabri, and in 1805 by Mannert.

The most influential pupil of Achenwall, August Ludwig v. Schlözer (born 1735, died 1809, official at St. Petersburg, professor at Göttingen), wrote in 1804 "Theorie der Statistik nebst Ideen über das Studium der Politik überhaupt." The plan of his theory is arranged as follows; *vires* (resources, soil, money), *unitæ* (form of the state and the administration), *agunt* (influences and effects). History is for him continuous statistics, statistics stationary history. (Th. Zermelo, Aug. Ludw. v. Schlözer, ein Publizist im alten Reich, 1875.)

#### § 18. CONTINUATION OF OFFICIAL STATISTICS.

In the bureaucracy and finance administration of all states, statistical matter covering a large field was collected and considered necessary, but seldom published. But little, therefore, of it is known.

Enumerations of the population took place: in Hesse-Darmstadt, 1742, 70, 88, 91 *et seq.*; Hesse-Cassel, 1747, 73, 81, *et seq.*; Gotha, 1754 *et seq.* annually; Saxony, 1755, 72, 83, 90; Hannover, 1755; Brunswick, 1756, 60, 88, 90; Denmark, 1769, 87; Bavaria, 1777; Mecklenburg-Strelitz, 1784; German Austria, 1785; Spain, 1787; the two Sicilies, 1788; Savoy and Nice, 1789. In North America the decennial census provided for in the constitution was carried out for the first time in 1790. In France a census of hearths was taken by the Duc d'Argenson in 1753.

Finance Statistics were published for Prussia, 1780, by v. Hertzberg, "Huit dissertations," for France by Necker, 1781, "Compte rendu au roi."

General statistics of countries were published for the two Sicilies by Galanti, *Descriptione geographica et statistica delle Sicilie*, 1787-1791; and for Tuscany *Governo della Toscana sotto il regno de Leopoldo II.* 1790; for Spain by Larruga, *Mémoires*, 1790-1797.

Collections of materials were published as follows: Aug. Ludw. v. Schlözer, "Briefwechsel," 60 pamphlets, 1775-1782, continued till 1794 as "Staatsanzeiger," with the co-operation of Count Carmer v. Hertzberg, Count Firmian, Duke of Saxe-Meiningen, and other prominent statesmen; Dohm, *Materialien zur Statistik der neuesten Staatengeschichte*, 1777-85; Le Bret, *Magazin zum Gebrauch der Staaten und Kirchengeschichte*, 10 parts, 1781-88.

State Almanacs appeared from 1700 on for the Netherlands, from 1704 for Prussia, from 1720 at Ratisbon, from 1728 for the Electorate of Saxony, from 1730 the royal calendar in England, from 1736 at Frankfort-on-the-Main, from 1740 the *Almanach de Gotha*, from 1775 for Mecklenburg.

Von Schlözer praises, in 1806, the new era of things in regard to publications, "How fortunate we statisticians of the new century, the disgraceful distinction between university and cabinet statistics has ceased to exist."

#### § 19. FURTHER DEVELOPMENT OF THE STATISTICS OF POPULATION.

Süssmilch had not gathered like the rest a circle of pupils (the third edition of his work was published by Ch. J. Baumann, 1790), yet the movement of population remained the subject of much attention.

Upon the proposal of Menander, Sweden commenced in 1741 the registration in all parishes of births, marriages, and deaths. The results were arranged by the Academy

in a work of Tables, beginning 1749, which were made the subject of scientific treatment in 1765–82 by Warentin. (Knapp, p.74. See § 13. *Mémoires de l'academie des sciences de Suède*, trans. by Kästner, 1767.)

Simpson in 1742, Déparcieux 1746, Deslandes 1750, furnished calculations of mortality.

Euler (born 1707, died 1783) wrote *Calcul de la probabilité dans le jeu de rencontre*, and demonstrated in 1753 the means of correcting Halley's tables on the basis of the average growth of population.

In 1765 the Equitable Life Insurance Institution on the mutual principle was founded at London.

Methods of calculation were made more exact by Price, 1771; Morgan, 1779; Tetens, 1786, and finally through the method of smallest squares by Friederich Gauss (born 1777, died 1855).

Condorcet (born 1743, died 1794) maintains in his "*Esquisse d'un tableau historique des progrès de l'esprit humain*," that human actions can only be conceived as happening according to the materialistic laws of nature.

## § 20. EXTENSION OF THE RANGE OF STATISTICAL PROBLEMS.

The mere continuation of the chief lines of statistical thought hitherto considered does not, however, exhaust the development of the science in this period. Numerous methods of observation and ideas were suggested, which seemed to show, on the contrary, that the range of subjects and ideas was capable of a very considerable extension. In a certain sense this may be termed a period of discovery in this field. Among characteristic works may be mentioned—

(a) On Population: *Messance*, *Recherches sur la population de quelques provinces et villes du royaume avec des reflexions sur la valeur du bléd tant en France qu'en Angleterre depuis 1674, jusque, 1764, 1766, and Nouvelles recherches sur la population en France avec des remarques*

sur divers objets de l'administration, 1788, concerning the effect of the price of grains and other contemporary conditions and measures upon the population. *Moheau*, Recherches et considérations sur la population de la France, 1778 (assisted by Montyon). *De la Pommelles*, 1789, Recherches statistiques sur la population de la France, concerning the results of the levy of troops. *Th. Rob. Malthus* (born 1766, died 1834, clergyman, professor of political economy), Essay on the principles of population, 1798; population, according to his view, increasing in a geometrical, the means of subsistence, on the other hand, in an arithmetical, progression, the danger of over-population is produced.

(b) On Agriculture: *Arthur Young* (born 1741, died 1820, merchant and agriculturalist), Political Arithmetic, 1774; Economic voyages in England, France, Spain, Italy, 15 vols., 1768-1795; Annals of Agriculture, 45 vols., 1784 *et seq.*

(c) On Commerce: *Raynal*, Histoire philosophique et politique des établissements et du commerce des Européens dans les deux Indes, 1771. *Seitwein*, Anfrage an das deutsche Publikum, die Handelsbilanz zwischen England und Deutschland betreffend, 1773. *K. v. Struensee* and *J. C. Sinapius*, Kurz gefasste Beschreibung der Handlung der vornehmsten europäischen Staaten, 1778-1782. *A. R. W. Crome*, Europas Produkte, 1782. *De Tolosan*, Mémoires sur la commerce de la France et ses colonies, 1798. *J. A. Noack*, Statistischer Versuch über die Handelsbilanz zwischen Deutschland und Frankreich, 1794.

(d) On Taxes: *Mauvillon* (Mirabeau), Monarchie Prussienne, 1788.

(e) On Churches: *Schönemann*, Grundriss einer Statistik des deutschen Religions- und Kirchenwesens, 1797.

(f) On Civilization in general: *Duc d'Argenson*, Considérations sur la gouvernement ancien et présent de la France, 1765.



## § 21. BEGINNINGS OF TABULAR AND GRAPHIC PRESENTATION.

With the endeavor to establish causal connections the statistical argument turned more and more toward the proof by numbers and away from descriptions and opinions of a general character. The excess and diminution, the rise and fall of the rows of figures became the means of measurement and proof. This means had a value of its own of the utmost importance for the investigations. Here, therefore, are the first steps toward a further progress in the method.

As early as 1741 Acherson, a Dane, had attempted in his *Description statuum cultiorum in tabulis*, to portray the most important features of the European states in tables of figures only. His data embrace area, population, religion, finances, armies, the political constitution, money, weights and measures. As long, however, as only highly unreliable and defective figures could be obtained, such efforts could not be crowned with success.

Even in 1782 little attention was paid to the idea of Crome in Giessen, who proposed to present the results graphically with geometrical figures. In 1785, however, he renewed his chart of the sizes of the European states, and in the year 1786 Plaifair in England came forward simultaneously with Randel and Remer in Germany with a very extended tabular treatment of statistical data. Beaufort in Paris and Gaspari and Boetticher in Germany in 1789, v. Hoeck in 1794, Ehrmann in 1796, Ockhart in 1804, and others followed in the same line, in part with charts and graphic presentations.

These efforts did not meet with the general approval of the statisticians. They remain, nevertheless, an important symptom of the developments which were to revolutionize the whole structure of statistical science.

## II. INSTITUTIONS FOR NATIONAL STATISTICS ON A SCIENTIFIC BASIS.

### § 22. NECESSITY FOR STATISTICS DURING THE FRENCH REVOLUTION.

The necessity of resorting to statistics makes itself felt at every essential change in the form of the state, just as in the transformation from the mediæval to the modern state. It proved to be so much the more indispensable in the unheard-of overturning of all existing conditions in the French revolution. According to the remarkable resolutions of the night of August 4, 1789, with irrepressible enthusiasm, the policy was accepted of creating new forms based on ideas along entirely new lines. A new administration, new courts, general elections, and general military service were the principles to be built up, on a new and geographical division of the state, designed to wipe out every remembrance of the historic ties which bound the districts together. In addition, there were new means of transportation, a new plan of custom duties, new weights and measures, new money, but above all the project of a new tax system, to be founded chiefly on the general income tax.

All these projects were obliged to seek the aid of statistics, and it was found with surprise how little material was in existence which could be used for their perfection.

The National Assembly therefore commissioned Lavoisier (born 1743, executed 1794) to collect as quickly as possible the data necessary for the preparation of the reforms in administration and finance. He fulfilled his task in an "*Aperçu de la richesse territoriale et des revenus de la France*," which he presented in 1790. He complains therein of the lack of sufficient material upon which to build. He estimates the population according to the ratio of one birth to 25.75 inhabitants, which had been

ascertained for other countries, though the ratio for France at least in the present century is 1 to 36.8. His calculations on the amount of land under cultivation proved surprisingly correct, though estimated simply from the number and capacity of the ploughs. (*Statistique générale de la France, Agriculture, Tome III., 1840, Rapport.*)

These considerations tended to spread the conviction of the necessity of systematically regulated returns.

#### § 25. BUREAUS FOR STATISTICS IN FRANCE.

With considerable enthusiasm quite a comprehensive statistical activity was developed, and the organization of statistical bureaus took place. The whole movement proved, however, to be merely temporary.

Necker had established for the statistics of finance and commerce a Bureau des renseignements, which was continued for the publication of the balance of trade.

For the general statistics of the country it was proposed to have expert agents in every borough, and in 1792 they were required to report certain facts to their supervisors, the Agents nationaux. In 1795 the minister François de Neufchateau established a bureau under Duquesnoy for the departmental statistics to be collected by the Prefects. The newly-established Kataster Bureau began some publications in 1798. In 1801 Chaptal commissioned Jacques Peuchet to give a description of a department to serve as a model, and organized a Bureau de statistique under Coquebert de Montbret for the purpose of securing statistics of the departments on this plan. The descriptions were completed for only 53 departments and were discontinued in 1815. Nevertheless, with the assistance of the coöperators in these works, there appeared, in 1803, Herbin's "*Statistique générale et particulière de la France et de ses colonies avec une description topographique, agricole, politique, industrielle et commerciale de cet état.*"

In 1804 appeared the "*Dictionnaire universel géograph-*

ique, statistique, historique et politique de la France," which had been ordered in 1790 by the National Assembly, and meritoriously completed by Prudhomme.

In 1804 the official work, *Statistique générale de la France* publiée par ordre de M. l'Empereur et Roi et rédigée sur les mémoires, adressés au Ministère de l'Intérieur par MM. les préfets, was successfully brought to completion.

Very few data of these works rest upon actual enumeration. Even the census of the population, which had been attempted in 1801 and again in 1805 had each time been successful only in the departments and the results varied greatly. An actual enumeration in Paris was accomplished for the first time in 1817, according to the plans of J. B. de Fourier. The estimates of experts furnished the largest portion of the material. Great errors were therefore possible. It required, however, by this method very little effort to broaden the sphere of the questions, and even secure estimates concerning things about which the persons interested would be disinclined to furnish information. The predominance of this form of official inquiry, which we call the *enquête*, is characteristic for French statistics down to the present day.

That under the circumstances statistics attracted general interest and became the fashion, is easily comprehended. In 1803, under the protection of Cambacères, a *Société de Statistique* was founded at Paris. Donnant and Peuchet published in 1805 text-books, in Achenwall's style, of *Statistique élémentaire*; in 1802-1804 Ballois edited *Annales de Statistique*; Deferrière, the chief of the statistical bureau, published in 1803-1804 *Archives statistiques de la France*. The "*Moniteur universel*," founded in 1789, as well as the "*Journal des Mines*," appearing since 1792, contained numerous statistical essays.

The empire, however, brought an end to all these efforts. Although Napoleon had said "*La statistique est le budget des choses et sans budget point de salut public*," he dis-

solved in 1806 the Commissions and the Société de Statistique, and prohibited all publications with the exception of four Exposéés de la situation de l'Empire, which were prepared by the Minister of the Interior, Count Montalivet, in 1809, 1811, 1813, and again in 1815 during the hundred days.

§ 24. STATISTICAL BUREAUS IN ITALY, SPAIN, WESTPHALIA,  
AND BAVARIA.

As a result of the increased interest in statistics in France, and in part at the orders of the French administration, some of the neighboring countries created statistical bureaus. They were, as a rule, short-lived. The Italian Republic received one in 1803, which, placed under the direction of Gioja, continued in existence until 1809. In Spain, during the French rule, a Departamento del fomento general del Reino was established. For Westphalia there was a statistical bureau under Hassel, in 1809, which did not survive the fall of the kingdom.

In Bavaria, General Raglowich attempted, in 1801, to found a military statistical bureau, which, however, did not last long. Later, an ordinance of December 12, 1806, provided for a regular report of lists of all births, marriages, and deaths in the new kingdom, and further ordinances of July 17, 1808, and September 27, 1809, directed the provincial authorities to send in annual reports of administration, and to combine with them the material for as complete statistics of the kingdom as possible. Returns were required especially concerning dwellings, number and movement of the population, immigration and emigration, mining, agriculture, trades, laborers and products, commerce, prices, institutions of credit, care of the poor, sanitary conditions, medical arrangements, and schools. As it was soon perceived that returns upon so various subjects could not be compared and were of little value unless made according to uniform schedules, ordinances of 1810

and 1812 provided special tables for the arrangement of the data. The returns for 1809-10 and 1811-12 embraced, nevertheless, 438 volumes in folio, and the bureau for topography and statistics, established in 1813, held the continuation and preparation of this material to be impracticable.

§ 25. FOUNDATION OF THE PRUSSIAN STATISTICAL BUREAU.

Much greater was the influence of the reorganization of the official statistics of Prussia. It was brought about in 1805 by Minister v. Stein on the proposal of Leopold Krug.

Krug (born 1770, died 1843) had written several statistical and economic works while still in subordinate official position in Halle. At his request, in 1799, he was admitted into the Prussian service as registrar in the "Lehn" department, with permission to make use of the secret registers of the departments in which, as in the time of Frederick the Great, statistical material was collected. Upon these foundations he prepared, in 1805, his *Betrachtungen über den National-Reichtum des preussischen Staates*. The two moderate-sized volumes contain his calculations on the Physiocratic basis of the gross national income from the returns of agriculture and the excess in foreign trade. From these he attempts to ascertain the net income of the nation after exclusion of the income which simply passes from hand to hand, by subtracting the entire consumption of home raw products and imported foreign products and manufactures. The method is obviously open to objection, but as a most careful turning to account of statistical data the book has great merits.

A Cabinet order of May 28, 1805, gave Minister v. Stein directions to establish a bureau for the continuation and correction of these data annually. In it the statistical material collected in the various departments could be united and formed into a systematized whole.

The bureau was established immediately with the Minister as chief. Krug was the only official, though Beguelin and others rendered assistance. Soon after, on May 22, 1806, the first annual report was ready. It comprehended 24 tables of varied contents on population, topography, agriculture, manufactures and commerce, transportation, excise, consumption, morality, and culture. Returns of churches and municipalities, of postal and tax administration, were lacking.

Upon the remonstrance of various bureaus and their demand that their communications should be kept secret, a Cabinet order of October 16, 1806, the second day after the battle of Jena, ordered that the publication of returns on population, production, manufactures, culture, commerce, shipping, and civil status should be permitted, but that the returns of private property, of moneyed institutions, credit systems, state debts, and public revenues (Boeckh, p. 28. See § 11) should not be published.

#### § 26. REESTABLISHMENT OF THE PRUSSIAN STATISTICAL BUREAU.

As soon as the peace of Tilsit permitted the regulation of the state affairs, an administrative order of the government of December 26, 1808, confirmed the previous regulations as to the statistical returns. Yet the necessary economy in the official service and the examination of Krug's plan by the "Oberprasidien" led to some restriction of its scope.

Joh. Gottfr. Hoffmann (born 1765, died 1847. At this time "Bauassessor," later Ministerialrath für Gewerbe Polizei, and professor) contended that only those questions should be asked to which it seemed reasonable to expect correct answers. He reduced Krug's questions to less than one-third, but drew within their scope all suitable material which could be gathered together from the affairs of the public offices. On account of these reasonable pro-

posals a Cabinet order of October 4, 1810, appointed him Director of the statistical bureau, with Krug and the topographer Engelhardt as associates.

His own principles, as well as the state of the finances, led Hoffmann to exercise the greatest caution, so as to burden as little as possible the officials who made the returns. What he brought together, however, was the result of an actual ascertainment of the facts. He preferred to abandon altogether the attempt to secure returns on agriculture, causes of death, churches, schools, and sanitary conditions than to content himself with unreliable data. His principle was a direct enumeration in everything. In this conception of the method he stood in an essentially contradictory position to that of the French statistics, and though enumeration and enquête are certainly to be justified or rejected according to the specific objects and purposes for which they are to be used, the enquête has never won for itself a prominent place in Prussian or in German statistics generally. The German statistics have not encouraged multiplicity in the returns, where it could not be obtained by additional enumerations, or by distinctions introduced into the enumeration, or by a combination of results obtained by direct enumeration.

Hoffmann's work rests, therefore, on an uncommonly limited basis of materials, but he understood how to use them with surprising versatility and productive power, and to supply the deficiencies from the rich treasure of his scientific acquirements and experience. (Boeckh, § 44. See § 11.)

## II. LIMITATION OF THE FIELD OF STATISTICAL SCIENCE.

### § 27. LIMITATION OF ACHENWALL'S STATISTICS.

The appearance of the official statistics in such vigor in France and Prussia was combined with a decisive revolution in the whole field of scientific statistics.



Although statistical bureaus were organized only gradually in other states, yet the necessity was generally felt of studying the state of the nation from the current affairs of its administrative offices, as well as from special returns at stated intervals.

This attention to the internal affairs of the nation contained in itself a certain antithesis to Achenwall's general descriptive comparisons of all nations. It soon appeared from the interdependence of the results that the statistics of Achenwall, of Büsching, and of Süssmilch, were merely parts of the same sphere of ideas. This was first recognized theoretically by Niemann in his "*Abriss der Statistik oder Staatenkunde*" (1804) 1807. (John, p. 119. See § 7.)

Even before the death of v. Schlözer it was felt that the fundamental ideas of Achenwall's statistics were shaken by the ever-increasing stream of official statistics and by the numerical treatment which was based on them. Tabular and graphic presentations and comparisons came more and more in vogue through the efforts of v. Brunn, Donnant, Lichtenstern, v. Schmidtberg, and especially Hassel (*Grundriss der Statistik*, 1805, 1809, 1825). But v. Schlözer with Lüder, Rehberg, Brandis, Heeren, considered this as an aberration (Lüder, *Geschichte der Statistik*, p. 214; *Kritik der Statistik*, § 14). In 1806 and 1807 a passionate controversy arose against the brainless bungling of the number statisticians, the slaves of the tables, the skeleton-makers of statistics. Undoubtedly the pupils of Achenwall were right that statistics cannot evade the consideration of the highest problems of political life. But they deceived themselves as to the manner in which this ideal purpose of statistics was to be attained. They underestimated the significance of the material prepared for comparison according to number and measure, the indispensable premise of every critically correct conclusion from statistics. The opponents in the sharp attack were them-

selves, however, not sufficiently clear how new and precise limits for their science should be determined.

§ 28. ELIMINATION OF POLITICAL ECONOMY, OF PUBLIC AND ADMINISTRATIVE LAW.

In this state of affairs the decisive factor in the development of statistical theory was the specialization of the various fields of knowledge which at the beginning of the century accompanied the increased intellectual activity and the unusual extension of the field of investigation and research.

Adam Smith, in his "Inquiry into the Nature and Causes of the Wealth of Nations," 1776, furnished a firm footing for the science of political economy by his clear definition, system, and method. With the beginning of the century political economy began to appear as an independent subject with special professors in the lectures and studies of the German universities, as well as in England and France. Thus the connection with other political sciences, and hence with statistics was dissolved.

In England, Stewart (1799), Malthus (1804), Ricardo (1812), McCulloch (1825), and others represented the new science; in France, Say (1803), Sismondi (1819), and Droz (1828). In Germany there were besides Garve, who translated Smith, Sartorius (1796), Jacob (1805), Kraus (died 1807), Hufeland (1807), Lüder (1820), Rau (1821), Pölitz (1823), and v. Rotteck (1829), all of whom lectured on political economy in Smith's manner as a discipline, which included all that related to economic policy, which the older school of Achenwall and indeed v. Schlözer held to be a field of statistics.

Similarly the closely connected subjects of public and administrative law severed their connection with statistics. There had been before this time separate chairs for these subjects in the universities, but at this time the separation became general and permanent.

The philosophical consideration of state and law by Kant (1796), Fichte (1796), and Hegel (1821), as well as the historical conception for which Justus Möser (1765) had given the stimulus, and which Schlosser (1777), Pütter (1786), and Eichhorn (1808) had moulded, gave new points of departure, and none of the works of Welker (1813), Haller (1816), Klüber (1818), Sal. Zachariae (1820), Pöhlitz (1823), and Heffter (1829), hold fast to the traditional connection with Achenwall's statistics.

#### § 29. ELIMINATION OF THE GEOGRAPHICAL ELEMENT.

The geographical notions which Seb. Münster and Pierre d'Avity and even Büsching had incorporated with statistics, showed themselves more and more to be a special branch of science.

Gatterer had endeavored in 1775 to lead geography away from the political and statistical basis, by giving prominence rather to the natural differences of the surface of the earth and the conditions which they impose on civilization. Zeune's "Gaea," 1808, had the same tendency.

Decisive in the matter, however, was the distinguished example of C. Ritter (born 1779, died 1859) in his voluminous "Erdkunde im Verhältniss zur Natur und Geschichte des Menschen oder allgemeine vergleichende Geographie." He places the reader in the position of the traveller, he appeals to the eye and heart, and gives exact information of events and experiences. The gaps in the material he does not attempt to conceal, but endeavors to place the reader in a position to supply them, as well as may be, by the analogies which his own judgment suggests. The result, therefore, is a difference in the principles of geographical and statistical observation. From the totality of the phenomena, geography judges from its standpoint as to what is unseen, and assumes by induction that what is typical may be found there. Statistics searches its entire field for distinct units, none of which may escape observa-

tion, but cannot draw into consideration any other phenomena. The results are for both mutually useful, but the methods by which they are obtained so totally different that the geographer is not as such a statistician, nor is the statistician as such a geographer.

### § 30. SEPARATION OF PRACTICAL LIFE INSURANCE FROM STATISTICS.

In the field of life insurance a complete separation from the statistics of population occurred, which continues up to the present day.

Life insurance assumed such dimensions that at the end of the century there were more than ten large institutions in England. Others were established in 1806 at Hamburg, 1819 at Paris, 1824 in Belgium, 1826 in Italy, 1828 at Lübeck, 1829 at Gotha, 1830 at New York, 1835 in Russia.

Of a similar nature were the widows' treasuries, which, in part at least, had been founded on earlier institutions, among them the Prussian treasury for the widows of officials, founded in 1776.

The failure of several inadequately equipped institutions in England, the investigation of the Caisse Lafarge in 1809 at Paris, and the discovery in 1836 of the swindle of the bubble companies did not interrupt this development.

Laplace, Baily, Lacroix, and Littrow advanced the necessary mathematical calculations. The more critically the basis of life insurance was examined the more evident it became that the order of mortality did not furnish a sufficient basis of calculation for the expectation of life among the persons of various ages and occupations who were seeking insurance. The attempt was, therefore, made to gain a scale for the tariffs from the growing material of the companies themselves. Milne prepared, about 1815, the Carlisle table on the basis of observations in Carlisle

from 1779-87; Finlaison, in 1829, the Government Tables from the tontines and annuities; Morgan, 1834, the Equitable experience table, from the experiences of that company between 1762 and 1829; and, finally, Brune prepared from the records of the Preussischen Allgemeinen Wittwenverpflegungs-Anstalt, from 1776 to 1834, a death table of great value for the widows' treasuries. While the general calculations of mortality did not lose their value as a measure of the welfare of the population, the close connection between life insurance and Süssmilch's statistics ceased to exist.

### § 31. DECLINE OF STATISTICS AS A SYSTEM.

The development of the new scientific studies, with their much more profound treatment, deprived Achenwall's Statistics of essential parts of its subject-matter. The data of the traditional system of "Staatsmerkwürdigkeiten" assumed unavoidably a superficial character, and statistics as a university study sank into insignificance. It is true Lüder (died 1819) in Jena, Meusel (died 1820) in Erlangen, Niemann (died 1832) in Kiel, Mannert (died 1834) in Munich, and Heeren (died 1842) in Göttingen, still taught statistics with success according to v. Schlözer's ideas. In Austria v. Holzgethan, Schnabel, v. Schlieben, Franzl, and others were able to keep the traditions of the school alive, as statistics so understood still formed a part of the requirements in the examinations for position in the official service.

But the old teaching died out with the teachers. Tabular statistics in their then condition could not be taught from the professorial chair. Lüder, although he recognized the merits of Süssmilch's statistics, felt the change so strongly that he doubted the possibility of scientific statistics (Lüder, *Kritik der Statistik und Politik*, 1812, § 57).

## § 32. STATE OF OFFICIAL STATISTICS.

To supply this deficiency seems to have been in a certain sense part of the idea which led to the foundation of the statistical bureaus. Originally topographical—statistical descriptions of the land, the character of its soil, its national and political relations, and economic conditions were required from them.

It soon became evident that the answers even to the simplest questions of population and industrial statistics, which were indispensable to the government, gave rise to a mass of material which could hardly be handled. It was found that often the most desirable information could by no means always be obtained from the current affairs of the offices, but required special investigations and returns.

The officers were bound by the bureaucratic rules of the service. Problems with distinct objects in view, and involving responsibility in their decision, were sent to them, cases where the solution could have the necessary certainty only by a wholly impartial, well-considered, and unerring investigation. The demands extended generally to all the details, to the differences between various districts, industrial classes, or local institutions, so that the greatest specialization was necessary.

For this imperative labor neither the officials nor the assistants, generally only temporarily employed, nor least of all the appropriations for these subordinate functions, were sufficient.

The activity of the bureaus became, therefore, on the one hand, more intense; on the other, more restricted. The concentration of all statistics in one bureau could not yet be thought of, and neither the same principles nor treatment governed the "ressort" arrangements in the different states. Though uniformity appeared later, yet until the middle of the century the organization and the enterprises

of official statistics retained an individual character, which makes them interesting on account of their many specific peculiarities.

#### IV. RISE OF NATIONAL STATISTICS IN THE VARIOUS CIVILIZED NATIONS.

##### § 33. FRANCE.

The Restoration was by no means more favorably inclined toward statistics than the Empire (§ 23). The publications were very meagre.

From 1815 appeared a yearly "*Tableau général du commerce de la France*," with returns on the coasting trade, published by the administration of customs. In addition there appeared from 1813 reports on recruitment (1830 by Pétigny), and from 1820 by the Marine Ministry "*Notices sur les colonies françaises*," and also "*Comptes rendus des travaux des ingénieurs des mines*."

In 1821-1829 Count Chabral, Prefect of the Seine, published comprehensive statistics of Paris, prepared by Villot, and 1825 and 1833 Guerry de Champneuf prepared reports on the administration of criminal justice.

In 1827 a *Société de statistique* was founded with official permission at Marseilles. At Paris the *Société française de statistique universelle* was permitted to organize in 1829. It was not till after the July revolution of 1832 that the Institut de France was allowed to reestablish the *Académie des sciences morales et politiques*, which had been suppressed during the Consulate. It contained a section for *Économie politique et statistique*.

In 1833 Thiers announced his intention to the Chambers of repeating the *Statistique générale de la France* on a new plan. He founded under Moreau de Jonnés a *Bureau de la statistique*.

This bureau published, 1835, Tom. I. *Finances*; 1837, Tom. II. *Territoire et population*; 1838, Tom. X. *Com-*

merce extérieur; 1840 and 1841, Tom. III.-VI. Agriculture (the results of the agricultural enquête of 1839-42); 1843 and 1844, Tom. XI., XII. notices from the general administration (Bienfaisance, Établissements de répression); finally, 1847-52, Tom. VII. and VIII., Industrie manufacturière et arts et métiers, the results of an industrial enquête begun in 1839 and taken up again in 1845.

Besides the above there were the publications of the administration of customs, of the Ministries of finance, of agriculture, and of commerce.

The events of the year 1848 led to a new enquête on rural and industrial labor. It was completed only in Paris by the Chamber of Commerce, and the results published in the valuable work, *Statistique de l'industrie à Paris*. On January 1, 1851, 2941 statistical cantonal and district commissions were organized for carrying through the agricultural enquête of 1852. The commissions supervised the returns to 500 questions in every canton.

In 1860, on the occasion of the treaty of commerce with England, a new and comprehensive enquête was undertaken by the Conseil supérieur de l'agriculture, du commerce et de l'industrie, of which "Agriculture" appeared in 1861. The enquête of Parisian industry was repeated in 1860 (*Statistique de l'industrie à Paris*, 1864).

In 1866 it was deemed important to demonstrate the influence of the treaty of commerce of 1860 on French agriculture. An enquête, concluded in May, 1870, was, therefore, undertaken under a special commission, whose labors, *Enquête agricole, ministère de l'agriculture*, 1869-70, fill 36 volumes.

In 1879 a new agricultural enquête was assigned officially to the Société nationale d'agriculture de France, the results appearing in 2 volumes, 1880, "*Enquête sur la situation de l'agriculture en 1879*," by Barral.



## § 34. PRUSSIA AND THE OTHER GERMAN STATES.

The official statistics of all German states assumed in contents and character great uniformity from the example of Prussia, and in consequence of the gradual development of common custom and tax systems. The organization of the bureaus and the mode of publication remained very divergent.

In Prussia the statistical bureau continued without changes to be the centre of the system (§ 25). Under Hoffmann, who surrendered the place in 1844 to Dieterici, and died in 1847, no regular publications were made. Hoffmann wrote essays in the "Staats-Anzeiger" and in the reports of the Academy. His first more extensive work was "Die Bevölkerung des preussischen Staates nach den Ergebnissen der 1837 aufgenommenen Nachrichten"; in 1838 appeared "Die Lehre vom Gelde"; 1840, "Die Lehre von den Steuern"; 1843, "Bevölkerungs- Geburts- Ehe- und Sterblichkeits-verhältnisse im Preussischen Staate." In the same period Ferber published, beginning in 1829, regularly his "Beiträge zur Kenntniss des gewerblichen und kommerziellen Zustandes des Preussischen Staates" from the papers of the ministry of finance. These were continued by Dieterici as "Uebersichten von Verkehr und Verbrauch im Preussischen Staate und Zollverein" in 1838, and from the following year by the "Centralblatt der Abgaben, Gewerbe- und Handels-Gesetzgebung und Verwaltung." Dieterici (born 1790, died 1859) published, 1846, the work "Der Volkswohlstand des Preussischen Staates," which compares the state of things in 1806, 1830, and 1845; and began after the census of 1845 with the "Statistische Tabellen des Preussischen Staates" the periodical publications of the bureau, for whose extension into all the details of the materials the new legislature of the country in 1850 had provided the means. From 1860 to 1882 the bureau was in charge of Ernst Engel (born 1821). In 1861 a central statistical commission was appointed.

In Bavaria (§ 24) the statistical-topographical bureau, established in 1813, transferred the preparation of special topographical charts to the Ministry of War. In the year 1818 the yearly reports were limited to a few returns, and after 1825 the reports were issued triennially. In 1833 and 1839 new ordinances wrought a change. With the last v. Hermann (born 1795, died 1868) began his work as Director. In 1850 he founded the "Beiträge zur Statistik des Königreiches Bayern."

Hannover made plans in 1831 for the regular preparation of the statistical material of the various branches of the administration. However, it was not till 1848 that the plan was carried into execution, with the organization of a statistical bureau. It published from 1850 "Zur Statistik des Königreiches Hannover."

In Saxony the first impulse was given by the Statistische Vereine für das Königreich Sachsen, which were founded in 1837 by v. Schlieben. The coöperation of the government enabled them to publish, up to 1849, 18 parts of their "Mittheilungen." This very honorable private work was transferred in 1850 to the Ministry of the Interior, which founded a statistical bureau on the Prussian model.

A statistical-topographical bureau was established in Wurtemberg, in 1820, under Memminger, but it was devoted almost exclusively to topographical labors. Statistics were furthered by the Verein für Vaterlandskunde, founded in 1822. It had almost an official character, and published its transactions in Memminger's Jahrbücher, founded in 1818. In 1856 the society was united with the bureau into a real statistical organ.

Baden endeavored, in 1836, to secure, by a commission of higher officials of the various departments, a preparation of its administrative statistical material. In 1852 a statistical bureau was founded.

The Electorate of Hesse collected in 1842 and 1850 the materials for a comprehensive statistical description of the country. But they were never published officially, though

used in the private works of Pfister, Landau, and Hildebrand.

Comprehensive materials were collected also in Hesse-Darmstadt, but they were not prepared till after the establishment, in 1861, of a central bureau for statistics.

Similarly the older returns in Oldenburg were prepared by the "Statistische Nachrichten," appearing after 1855.

Nassau published in its State almanacs, beginning in 1819, the results of its official statistics.

Hamburg created in 1844 a Bureau for Indirect Taxes and Shipping, which published from 1849 "Hamburgs Handel und Schiffahrt." In 1866 another bureau for population and tax statistics was established.

In 1846 Bremen organized a bureau for the returns of the movement of trade, which gradually enlarged its functions into a general statistical office.

### § 35. THE GERMAN CUSTOMS UNION (ZOLLVEREIN).

The German Customs Union was of the greatest importance in the growth of German statistics.

The customs treaty, of October 25, 1819, between Prussia and Schwarzburg-Sondershausen contains all essential ideas of this preliminary step in the political regeneration of Germany, and among them certain important statistical requirements.

The uniform custom duties collected at the boundary of the State which, by law of May 28, 1818, superseded the former provincial customs system in Prussia, included in the customs limits parts of other German states. Prussia, therefore, proposed to divide the net income of customs with them upon the basis of population. The fulfilment of the plan required a triennial census of population, and a uniform system of internal taxes on production and consumption. Sondershausen accepted, and between 1823 and 1826 most of the Thuringian and Saxon states followed. In 1828 the Customs Union treaty with Hesse-

Darmstadt gave rise to the idea of a common administration by the states of the Union, to which were added in 1832 the Electorate of Hesse and Homburg, in 1833 Bavaria and Wurtemberg, and in 1836 Nassau and Frankfort-on-the-Main.

The foundation of a uniform census of population, of exact returns concerning revenue and expenditures, and the movement of merchandise and the uniformity in various matters relating to customs and taxes constituted the subjects for settlement by the General Conferences in affairs of Customs and the Union, of which fifteen took place between 1836 and 1863, and of which the discussions were published. The statistical returns appeared from 1841 in 20-30 pamphlets yearly, the so-called "Commerzialnachweisungen," which were carried back to 1834.

As far as possible, it was sought to ascertain for each state the actual consuming population in each year. The resolutions of the general conferences of 1834, 1843, and 1845, which abandoned the simple distinctions of actual population and legal population, and required the return of the resident population, led to great difficulties and to the utmost complication in the form of the questions to be answered. In 1845 the ordinance required that the enumeration be made on a single day, the 3d of December, by house to house visitation, and with the return of each person by name.

Tariff politics came more and more to the front, particularly when the union with the Tax Union of Hannover, Brunswick, and Oldenburg was consummated in 1852, and during its discussion. The returns concerning trade were therefore extended, and industrial statistics resolved upon. They were collected in 1846, and on a larger scale in 1861. From 1860 yearly statistics of mines were published.

After the treaty of July 8, 1867, the Customs Parliament replaced the Customs Union. The defects and faults of the existing statistics were so strongly felt that the Bundesrath agreed to the appointment of a commission for the further

development of the statistics of the Union. Before they could complete their labors the constitution of the German Empire, of April 16, 1871, united all the German states. But from their investigations were determined the foundation and sphere of action of the Statistical Office of the German Empire, established July 21, 1872. (*Statistik des deutschen Reiches*, Bd. I., 1873, Einleitung.—Meitzen in (*Holtzendorff*) *Schmoller, Jahrbuch für Gesetzgebung und Verwaltung*, I., 1872 II., III.)

### § 36. HOLLAND, LUXEMBOURG, AND BELGIUM.

In Holland the published reports of the administrations of finances and colonies reach back to an early date. In 1801, 1806, 1829, and every ten years since a census of population has taken place, and in 1816 and 1825 enumerations of cattle. A statistical bureau under Smits and a statistical commission were established in 1826; but both of these institutions fell to pieces when Smits, in 1830, joined the Belgian uprising.

By the treaty of February 8, 1842, with Prussia (*Preussische Gesetzsammlung*, p. 92), which has been continued to the present day, the Grand Duchy of Luxembourg was included in the German Customs Union. All custom laws and ordinances had the same force there as in the Rhine province. Luxembourg took part, therefore, in the statistics of the Customs Union.

Holland established in 1848 a statistical bureau in the Ministry of the Interior, which flourished under Baumhauer (died 1876), but was replaced in 1878 by a statistical commission, as the greater part of the statistics had remained the concern of the various departments.

Belgium in 1830 established, under Smits, the *Direction de la statistique générale au ministère de l'Intérieur*. The entirely new organization of the state, the census and elections of 1832, and, above all, the law of May 1, 1843, whereby the state undertook the construction of the rail-

roads, with the consequent struggles and decisions on the plan to be pursued, made great demands on the official statistics. This led to the development of an intense activity in various fields.

In 1841 Quetelet, who had the supervision of statistics in the ministry, created the Central Commission for Statistics. It was composed of officials and scholars, and its valuable deliberations were published, after 1843, in the *Bulletin de la commission de la statistique belge*. Provincial commissions supervised the collection of the data. The preparation for the general census of October 15, 1846, is to be noted as the turning-point in the ideas as to stricter methods for all kinds of statistical returns. This census of 1846 (population, agriculture, industry) was the first of the series of enquêtes of 1856, 1866, 1876, and 1880. Besides this, the work "*Statistique générale de la Belgique, exposé de la situation du royaume*," in 1852, gave a description of the development of the country in the ten years from 1840 to 1850. Since then it has been continued in decennial periods.

### § 37. AUSTRIA-HUNGARY.

The establishment of a topographical-statistical bureau for the Empire was proposed in 1810 and 1819, but not carried out until 1829, by the General Auditing Department, under v. Metzburg (died 1839). At that time 104 tables and charts were prepared from the material of the previous year, and 100 copies of them in writing were distributed among the various governmental offices. The repetition ordered in 1830 covered the period subsequent to 1819. A hand-book on the state of the realm was prepared in 1830.

Freiherr v. Kübeck secured an imperial order of March 31, 1840, creating the Direction of Administrative Statistics as an independent body. Lucam was the first director, his

successors 1841-66, v. Czörnig (born 1804), Fricker, and v. Inama-Sternegg.

It was not until 1845 that publication of the returns was permitted, and then only for selected portions. In 1846 the "Tafeln zur Statistik der oesterreichischen Monarchie für 1842" appeared. Up to 1853 four other works, containing the data for the years 1843-48, followed. After the transfer in 1848 of the statistical work to the Ministry of Trade, a new series of tables on Territory, Population, Administration of the state, and civilization, began with 1849. The customs administration published from 1840, reports of the movement of trade. After 1859 there appeared from the Ministry of Finance reports on the finances. Nevertheless centralization of the official statistics remained the rule, and this was continued under the Statistical Central Commission, created in 1863, except in so far as after 1867 it was limited to the kingdoms and countries represented in the Reichsrath. In 1872, however, a statistical department was formed in the Ministry of Trade, and in 1873 in the Ministry of Agriculture.

The Hungarian statistics have been prepared since 1867 by a statistical bureau in Buda-Pesth. Centralization is here the rule, according to a law of 1874. In 1868 a statistical central commission was formed here also.

### § 38. GREAT BRITAIN.

No other country gave such early and extensive publicity to its statistics as Great Britain. The Parliamentary papers mentioned in § 10 are in addition to the reports of revenue and expenditures, very rich in reports from officials, and Parliamentary Commissions, on the various questions which engage the attention of Parliament. These often led to annual repetitions, and had as a consequence the establishment of statistical departments, such as that in the Board of Trade 1832, and in the Home Office 1834.

The proposal of a general census of population was first made in 1753, but was not acted upon. When renewed in 1800, it was agreed to. It was decided that the census should take place every ten years. The first, under the charge of Rickmann, took place in 1801. With it was required an abstract from the parish registers, giving the number of baptisms and funerals for every decade from 1700 to 1750, and for every year after the last named. From them Finlaison calculated backward the population of England in 1700 at 5,131,516 souls.

The returns of 1801 distinguished simply sex, possession of a house, and chief occupation in agriculture, commerce, manufacture, or as an artisan. Gradually the questions were increased. The return of age was in 1821 voluntary, and in 1841 the attempt was made to obtain the ages in certain classes—twenty-year periods for the rural and five-year periods for the urban population. The census of 1851, however, attained a high degree of completeness.

Returns of the movement of population were first required from the parishes in England in 1800, in Scotland 1807, and in Ireland 1810. The numerous sects necessitated the registration by the state. The law of August 17, 1836 (6 & 7 Will. IV. Ch. 36), for England and Wales required the commissioners of the poor to establish registration districts, with registrars responsible to a superintendent. From every registry a copy is sent to the Registrar-General in London, in whose office they are carried into the General book accessible to the public. Similar institutions were created in Scotland 1854 (17 & 18 Vict. Ch. 80), and in Ireland 1863 (26 Vict. Ch. 11).

The Registrar-General's office has since received charge of the census, formerly the work of special commissions, and in Ireland also of the statistics of agriculture.

In England and Scotland statistical societies undertake the collection and preparation of agricultural and other statistics. The Manchester Society was founded in 1833. The London Society, which includes almost all statistical



authorities of the country, and has published since 1838 a valuable journal, was founded in 1834. The great agricultural Enquête for the United Kingdom, in 1879-82, was the work of a Parliamentary Commission on Agricultural Interests.

### § 39. UNITED STATES OF AMERICA.

The English colonies in North America had an obvious interest in ascertaining, even earlier than the mother country, the number of their population. Data on the subject reach as far back as 1607 for Virginia, 1700 for South Carolina, and 1710 for North Carolina. In all the British possessions in North America 1,083,000 souls were enumerated in 1753.

The Constitution of September 17, 1787, prescribed as a legal basis of the elections an actual enumeration of the population within three years, and a repetition every successive decade. Poll taxes and other direct taxes can be laid only in accordance with the population thus ascertained. The first census took place in 1790, and has since been continued regularly. It is the concern of the National Government, and was carried out before 1880 by the United States Marshals. Besides the enumeration of the population, the census contains statistics on the movement of population, on agricultural, industrial, commercial, and other economic relations.

The Constitution further provides that Congress shall legislate on finance, currency, national defence, and general welfare, and that all duties and taxes shall be uniform. The care of the postal service and the regulation of patents are in the hands of the Union. From these functions, and from the right of supervision vested in Congress, there has arisen a mass of public documents, as in England, full of reports and statements. The necessity of a permanent statistical office has not been felt until recently. The work of the census is carried on in bureaus organized for the purpose. A law of 1866 created a statistical bureau for

commerce and shipping in the Department of the Treasury. The United States Bureau of Labor has issued valuable statistical reports since 1886, and in the publications of other government offices, to which reference has been made, much material is to be found.

Many of the states have established bureaus for labor statistics, which have furnished some excellent studies. A prosperous statistical society, the American Statistical Association, founded in 1839 in Boston, is doing good work for statistics.

#### § 40. DENMARK, NORWAY, AND SWEDEN.

Before 1833 all statistical data in Denmark were government secrets. Among the general public, neither the value of imports and exports, nor the results of the financial administration were known. Nevertheless, a census of population occurred in 1769, and in 1801 for the kingdom and the Faroe Islands, and in 1803 and 1810 for Schleswig and Holstein.

In 1831 representation of the estates had been introduced, and in 1833 the king appointed a commission of higher officials, who, without a special bureau, published 18 volumes of tables on all branches of statistics between 1833 and 1849. In 1849 with the constitution a statistical central office was established, whose chief was to have a voice in all statistical questions which might arise in the various departments. The bureau continued, aside from the separation of Schleswig-Holstein, the former tables, and united the statistics of the country, so that now only medical statistics are in other hands, a committee of the Royal Medical Society.

Sweden and Norway built up their official statistics of population chiefly on a thorough and exact preparation of the parish registers, which had existed (§ 19) in Sweden since 1749. In Norway a general census of the population occurred in 1801 and in 1845. For the greater part of the

administrative statistics, and particularly for the agricultural returns, reports of the chief branches were published every five years after 1830 in both kingdoms. A suitable preparation of these reports in connected form was proposed as early as 1839.

For this purpose, in 1846, a statistical bureau was attached to the Ministry of the Interior in Norway. It publishes statistical tables of the kingdom. In addition, medical statistics have been published since 1827, and finance reports since 1838.

In Sweden statistical bureaus were established in 1830 in the Ministries of Trade and Justice. Since 1851 have appeared the "Contributions to the Official Statistics of Sweden," which contain the publications of the various departments. A statistical central office was established in 1857 and united with the Tables Commission.

#### § 41. RUSSIA.

An ordinance of 1802 prescribed in Russia for the eight newly established ministries the collection and publication of statistical data and periodical reports. At that time were begun the publications of certain departments, particularly the tables of foreign trade and shipping, which have not been interrupted. Further facts may be found in the annual report of Minister Kotschubey in 1804, published in Storch's journal.

In 1831 Pogodin investigated historically the reports which had been required as early as the time of Peter the Great. In 1833 it was ordered that proper subjects from his work, at least in outline, should be published.

In 1834 statistical committees were formed in the *gouvernements*, consisting of the chiefs of departments and members chosen by the committee, with the Civil Governor as president. The results were sent for further preparation to the statistical department of the Ministry

of the Interior, which beginning in 1843 published "Materials for the Statistics of the Russian Empire."

In 1852 a central statistical commission was created in the same Ministry. At the same time there existed statistical sections in the Ministries of Finance and Agriculture, and since 1853 a statistical committee in the administration of roads, transportation, and public buildings. The central commission published, in 1860, "Tables of the Russian Empire," and since 1866 regularly the statistics of the empire. Besides these there are the publications of the various departments. However, actual returns even of population are so difficult to obtain that the data for the greater number of the *gouvernements* rest not upon actual enumeration, but merely on the reports of officials and committees.

#### § 42. SWITZERLAND, ITALY, SPAIN, PORTUGAL, AND GREECE.

In Switzerland some of the cantons had enumerations of population very early, at least at the beginning of the present century. In 1836 a table of the results for all cantons was published. Before 1848 common statistics for all Switzerland could only be obtained on trade and customs. The Federal law concerning the organization of the Federal Council of May 16, 1849, designates the collection of statistics as one of the functions of the latter. In 1850 a general census of population took place, and was prepared by Franscini for publication in Vol. I. of the "*Beiträge zur Statistik der schweizerischen Eidgenossenschaft.*" But without money and executive power over the cantons the federal statistics of the movement of the population proved, in 1852, to be impracticable. The Federal law of January 21, 1860, improved this state of affairs, though it limited the obligation of the cantons to enumerations of population and cattle. Since then a Federal Statistical Bureau is in operation.

In Italy (§ 24) there was always the greatest interest for

statistics, but Zuccagni-Orlandini shows in his "*Corografica Italica*" (1835-1845) how nearly impossible it was to combine the data of the numerous states. (Caesare Correnti in *Annuario Statistico Italiano* for 1857-58.) Sardinia had a Commissione superiore di statistica which published the census in 1819 and 1838 with comparisons. In 1842 appeared Avet's "*Statistica giudiziaria*," which was continued in 1852 and 1857 by a special commission for civil and criminal justice. Tuscany collected annually by means of a central bureau the movement of the population, and founded under Zuccagni, 1849, a Direzione di statistica generale. Sicily received as early as 1832 a statistical bureau, the continental part of the kingdom in 1851. Parma was described from official sources by Molossi, and Modena by Roncaglia, in 1829. For Rome the census of the population of 1853 was prepared by Grisi. The data then extant were collected in 1862 in the official work, *Censimento degli antichi stati Sardi e censimenti di Lombardia, di Parma, et di Modena*.

Since the foundation of the kingdom of Italy statistics have gained in uniformity and in extent and importance. In 1861 a statistical bureau, and in 1868 a statistical central commission were established. The *Statistica del Regno d'Italia* appears since 1864 in numerous volumes, and besides these there are the extensive publications of the various departments. The Direzione della Statistica had been attached to various Ministries, but as a rule, and permanently since 1878, to the Ministero di agricoltura industria et commercio. The director was until 1872 Maestro, since then Bodio (born 1840).

In Spain (§ 24) periodical statements of trade with foreign countries and with the colonies exist since 1849. In 1856 a Direccion general de estadistica was established, and reorganized by law of June 5, 1859. It began in 1859 the publication of an *Annuario estadistico*. Before this we have only a few private works, such as the *Diccionarii*

estadistici of Minano, 1826, Madoz, 1846, and de Plaza, 1852, which were based on official sources.

For Portugal there appeared in 1817 a *Diccionario*, and in 1822 a statistical description by Balbi. The different Ministries among which the statistics are divided, published only a few details. The Ministry of the Interior undertook a census of population in the years 1838, 1843, 1849, and 1850. In 1857 a statistical central commission was established, and in the year 1859 a statistical bureau in the Ministry of Trade and in 1860 in the Ministry of War.

In Brazil a census of population was attempted in 1817, and repeated in 1872.

Greece incorporated, at the organization of the state in 1834, a statistical bureau in the economic section of the Ministry of the Interior. It has published since 1861 the statistics of Greece.

## V. CONCEPTIONS OF THE METHOD AND PURPOSE OF STATISTICS.

### § 43. INFLUENCE OF OFFICIAL STATISTICS.

The development of official statistics in the most important countries, the participation of numerous statistical and other offices, the occupation of trained statisticians in the service of the state, have all combined to make this particular branch of statistical activity the predominant one.

In the nature of things there was a certain limitation, a one-sided specialization in these labors of the official institutions. Their functions must be exercised rather as an art than as a science. Their work is divided up for immediate practical purposes into a host of changing single problems, and the more successfully the special effort attains its goal the weaker becomes the incentive to seek for underlying reasons and general interdependence. Special branches of statistical practice could therefore undergo quite an

independent and individual development. They could indeed receive a more or less complete theoretical foundation, and yet the science as a whole lack entirely the necessary uniformity and simplicity of a theoretical basis and the needed rounding off of its sphere of ideas. The development of the technique, its adaption to the end in view, and its application under given circumstances were the results of the work of the official institutions in this period. The acute criticism of a man like Hoffmann had, therefore, no pronounced tendencies for any line of theory. Almost averse to all theoretical exposition, he drew his conclusions with remarkable simplicity and directness. His critical demands scarcely appear to us to-day as particularly remarkable, but at the time they were new and led to great innovations. Their tone seems to us modest and reserved, but the reason is to be found in the limited means and the undeveloped processes of securing returns of that day.

Every conclusion of empirical science is based on something which must be assumed as fixed and known. This, however, may be open to question, and we may, of course, go on indefinitely calling into question the basis of the reasoning. Nevertheless somewhere in this course these critical doubts must be considered as removed; but this point is determined only gradually, but as time goes on more and more thoroughly by theory and practice. The progress of criticism is hesitating because more exact demands are conditioned upon more exact means for their realization.

Preoccupation with the specific problem to be solved, criticism of the results rather than the origin of the data, and a certain empiricism in the conception of the method are the predominating characteristics of the official statisticians of the period. The same is also true of the private persons who devoted themselves to the statistical description of countries or comparisons of them, as Padovani

(1817), Balbi (1822), v. Malchus (1826), Schubert (1835-48), Frhr. v. Reden (1846), and others.

#### § 44. PERFECTING OF SÜSSMILCH'S STATISTICS.

Süssmilch's statistics, by their special field of investigation, were obviously limited to the numerical conception and treatment of their data, and were theoretically, therefore, the most developed. This was not because they had successfully surmounted greater difficulties, but rather because the limited field permitted more facile demonstrations, and therefore a certain completeness in their conclusions. The details of the investigations concerned only a small sphere of phenomena. It naturally suggested itself therefore to note the coincidences or divergences of the results, to observe their continuity, and to draw conclusions as to the causes and effects of these facts. It followed as a matter of course that the clear numerical relations should become the subject of consideration and lead to the attempt to ascertain further regularities.

Among the works may be mentioned:

1814. Laplace (born 1749, died 1827), *Essai philosophique sur les probabilités*, quite in the line of the views expressed by Condorcet (§ 19).

1821-29. Fourier (born 1768, died 1829, physicist), *Notions générales sur la population*, and two *Mémoires sur les résultats moyens*, etc., appendices to *Recherches statistiques sur la ville de Paris* and to the census of Paris of 1817 (§ 23). In these he states the first algebraic formula for calculating mortality tables in a stationary population, and calls attention to the differences in the calculation resulting from taking whole years or dividing the years into sections. (Knapp, p. 78; see § 11.)

1825-37. J. C. Casper (born 1796, died 1864, Medizinalrath in Berlin), *Beiträge zur medizinischen Statistik*.

1826. L. R. Villermé published an investigation of the monthly distribution of conceptions and births in their relations to climate, labor, nutriment, customs, etc.



1839. Ludw. Moser (professor in Königsberg), *Gesetze der Lebensdauer*. This criticises keenly the results of preceding work, and establishes precise propositions as to various methods of calculation and interpolation, mortality in various classes and positions in life in a non-stationary population, and in the relations of marriages, conceptions, births, stillbirths, widowhood, as well as life and annuity insurance, tontines, etc.

In 1842 Hermann (§ 34) began in Bavaria his attempt to ascertain the mortality by direct observation of the deaths of persons born in a given calendar year.

#### § 45. PAUPERISM AND QUETELET'S WORK ON MAN.

The study of population was broadened by certain contemporaneous conditions and circumstances into a philosophical and sociological treatment of moral statistics.

About the end of the third decade of the present century the fear of over-population, which, based on the ideas of Malthus, had its origin in England, became general. In 1828 de Gerando wrote "*La visiteur des pauvres*." The preparatory labors for the English poor law of 1834 became well known. Between 1834-36 numerous works on pauperism appeared by Jürgen-Hanssen, v. Lüttwitz, Godefroy, Villeneuve-Bargemont, Heiberg, Senior, Schmidt, Duchatel-Neuville. In 1832 Fourier published the periodical "*Phalangstère*." The general tendency of thought is reflected in the successes of the novels of Alexander Dumas and Eugene Sue. In 1839 "*Les crimes célèbres*" appeared, and in 1842 "*Les mystères de Paris*."

With the increasing consciousness of human community awoke also the feeling of the contrasts of society, which, however, degenerated into a specious apologetic of moral offences. Crime was treated as an unavoidable consequence of untenable social conditions, and in this way an approach was made to those conceptions of population

statistics which regard the numbers as evidence of natural laws.

The first representatives of moral statistics, Francis d'Ivernois, in his investigations of the comparative morality of nations, 1833, and Guerry, in his essay on the moral statistics of France, 1834, perceive in the constancy of the numbers nothing more than the influence of constant factors and conditions.

A confirmation of these views, and at the same time a more profound, more humane, and more interesting exposition of them was given in Quetelet's work, "*Sur l'homme et le développement de ses facultés ou essai de physique social*," which appeared in this agitated period, in 1835.

Lambert Adolphe Jacques Quetelet (born 1796 at Ghent, died 1874, 1814 professor of mathematics, 1828 director of the observatory at Brussels) published in 1829 *Recherches statistiques sur le Royaume de Pays Bas*, and was appointed chief of the Belgian statistics (§ 36).

His work, *Sur l'homme*, declares expressly the constant averages in moral statistics to be a proof that the actions of mankind are regulated by laws. Among individuals the natural forces which tend toward the preservation of these laws are indeed influenced by disturbing forces resulting in accidental and individual phenomena. In the totality of mankind, however, the laws clearly appear. They are not however inalterable, but dependent on existing societary conditions. Natural influences are more or less counteracted by others, the products of civilization. The general and periodic influences are more effective than the individual ones. In all cases an average standard is the best, and is obtainable statistically. The average man would, it is true, be different at every period, but would nevertheless represent a state of equilibrium, the true type of the totality of operating influences. Man advances, however, by his intelligence to a condition no longer that of nature. Virtue, like nature, is unchangeable, but the intelligence of mankind develops just as does that of individuals. All

individual development is determined by the conditions of society, by the course of great events. Society is responsible for the criminal as well as for the great man. The criminal is merely the instrument of society. He is the propitiatory sacrifice of society; his crime the fruit of the conditions under which he lives.

Quetelet nevertheless excludes any thought of fatalism (*Letters à S. A. le duc de Saxe-Coburg*, 1846). He sees the workings of law merely in the phenomena of the great masses, and denies expressly any constraining force on the individual. But it cannot be denied that he does not solve the contradiction, and that he does not speak clearly as to the responsibility of the individual for his actions.

The masterly book found a warm reception, more among the general public, it is true, than among the statisticians. The latter could not fail to perceive the weak points in the deductions and in the idea of the average man. But the depth and moderation of his views and the noble humanity of his spirit won for the author great personal influence and regard among them, which he preserved till his death.

#### § 46. CONCEPTIONS OF STATISTICAL THEORY.

If we mean by theory the fundamental idea from which the varied contents of a sphere of knowledge recognized as homogeneous can be uniformly understood and systematically grouped in the circle of general knowledge, then we may see already the beginnings of such penetration into the material and processes of statistical investigation.

The train of thought in Achenwall's school was directed merely toward the description, comparison, and examination of a certain mass of essential conditions in various single states. The contents of the numerous theories of statistics which emanated from the school, and which appeared to them to exhaust the subject, consisted simply in the systematic arrangement of these particular data.

When, however, the table statisticians brought forward the idea that the examination of the "Staatsmerkwürdigkeiten" cannot be fruitful without distinct numerical measurements, the consequence was obvious that the essence of statistics must be sought in this measurement of phenomena. Thus the idea of a distinct methodical procedure, which had thus far been limited to the calculation of probabilities, was greatly extended in its scope. F. J. Mone (*Theorie der Statistik*, 1824) says in this view of things, "The method of statistics is the art or science of uniting as a whole all statistical material. For this purpose the materials must be sought, collected, classified, ordered, arranged, and combined, in order to make a single or, so to speak, an organized entirety."

Melchior Gioja (§ 24) presented in 1826 in his *Filosofia della statistica*, a well-developed system on the nature and the evidential value of the indications, which permit conclusions as to certain conditions and influences, and as to the causes and intensity of these influences.

His friend Romagnosi demonstrated in 1827 and 1828 in *Questioni sull' Ordinamento delle statistiche* (*Annali universali di statistica*, Vol. XIV.), that every statistical problem requires for its solution a well-considered plan, exact execution of the necessary observations, examination and scrutiny of the results obtained, and, finally, conclusions capable of demonstration.

The London Statistical Society in its programme of 1838 (*Journal*, Vol. I., 1838), declares that the discussion of cause and effect is not within the province of statistics. "It is not, however, true that the statist rejects all deductions, or that statistics consist merely of tables of figures; it is simply required that all conclusions should be drawn from well-attested data, and shall admit of mathematical demonstration."

About the same time Potlock (an address explanatory of the objects and advantages of statistical inquiries, 1838)

declared that all actual things, or facts, qualities, and the like which could be collected in numbers were statistics.

Cournot (*Exposition de la théorie des chances et des probabilités*, 1843) understands as statistics the science which has for its subject the collection and comparison of numerous facts of every kind, with the purpose of ascertaining the numerical relations which appear independent of accidental exceptions, and thus denote the presence of regular causes whose effects are combined with those of accidental causes.

Moreau de Jonnés (§ 33) says (1847) briefly statistics is the science of social facts expressed in numerical terms.

Yet all these obvious advances in the conception of the theory were isolated. In addition to the traditional ideas of the State statistics, we now have Quetelet's almost mystical hopes of finding in the statistical figures, laws of the cosmological order, and of the world's history, and of making this aim the fundamental principle of statistics.

At that time J. Fallati (born 1809, died 1855) attempted in his "*Einleitung in die Wissenschaft der Statistik*" (1843) to determine the real conception of statistics. It seems, however, that although he makes some important distinctions, and shows some insight into important problems, his explanation of the essence of statistics remains obscure.

There was so much confusion among these contradictory views that in 1847, at the instance of Fallati, Schubert and v. Reden, a special commission to investigate them was appointed by the *Germanisten-Versammlung*, founded in 1846.

This state of affairs led A. A. Knies (born 1821) to write "*Die Statistik als selbstständige Wissenschaft, zur Lösung des Wirrals in Theorie und Praxis dieser Wissenschaft.*" He proposes to exclude from statistics proper the statistics of Achenwall as merely historical, and to hold fast to the political arithmetic, which should be developed by exact mathematical methods.

## D. THE DEVELOPMENT AND PREDOMINANCE OF THE STATISTICAL METHOD.

### I. THE INTERNATIONAL STATISTICAL CONGRESS.

#### § 47. OCCASION, ORGANIZATION, AND DURATION OF THE CONGRESS.

The prevailing confusion in regard to the scientific development of statistics was removed to such an extent by the International Congress, that this forms a decisive turning-point for theory and practice.

The plan of the Congress was formed in 1851, at the London Industrial Exposition, by Quetelet, Vischer, Dupin, Farr, Porter, Fletcher, Kennedy, and others. On account of the interesting features in the Belgian statistics (§ 36) Brussels was fixed upon as the place of meeting. The Belgian government was highly favorable to the plan. It presented to the representatives of all nations the plan of a gathering for free discussion, requested the appointment of delegates, and invited numerous statisticians and other scholars. The Statistical Central Commission formed the plans for the meeting, and entrusted their execution to a committee on organization, with Quetelet as chairman. For the purposes of the meeting a programme containing the questions to be discussed and the answers of the referees was prepared, and a division into sections adopted. Rules of order, containing provisions for resolutions, minutes, the language to be used, publication of proceedings and papers, etc., were also prepared.

The first assembly took place September 19, 1853. The success was unexpected. Repetitions of the Congress at intervals were generally desired, and meetings occurred in 1855 at Paris, in 1857 at Vienna, in 1860 at London, in 1863 at Berlin, in 1866 at Florence, in 1869 at the Hague, in 1872 at St. Petersburg, and in 1876 at Budapesth. The

preparations for the first meeting had been so well made that the permanent organization of the Congress was effected on the same basis. The encouragement of the governments, the numerous attendance, and the dignified and earnest character of the deliberations were features of all the assemblies.

In 1869 and 1872 it was decided to organize a Permanent Commission. Its duties were to publish the resolutions of the Congress, to secure information as to their effect, to promote the possibility of comparison in the publications of the various states, to prepare subjects for discussion, and request from the various states the statistical material necessary for their investigation, and, finally, to promote comprehensive international statistical investigations. Further assemblies were frustrated by the endeavor to make this commission a permanent organ in the official statistics of the various states, and the failure to see that the practical statistics of any country could not be determined by such a Congress.

#### § 48. WORK AND INFLUENCE OF THE CONGRESS.

At the inauguration of the Congress Quetelet defined its purpose as follows: The deliberations should endeavor to influence the statistical work of the various states, in order to increase as much as possible the facility of comparison, and, further, to bring about uniformity in the investigations and terminology.

The subsequent attempt to establish international statistics met with little success. Even the simplest problems proposed (Population by Quetelet and Heuschling, 1865, and *État de la Population* by Berg, 1867) showed that the obstacles to the desired completeness and comparability could not be overcome without recourse to a complicated system of hazardous hypotheses. The investigations which were proposed by the Congress were adopted nowhere without essential changes and limitations. It would have

been impossible for the Congress to determine what in each particular country might be practicable. Nevertheless its discussions were of very great utility. As shown in Appendix II., the discussions of the Congress touched nearly every single problem of official statistics. As a rule, the referee for each problem was a statistician, from the country in which the most satisfactory solution of the problem had been given. The general features of the problem were familiar at the outset. The proposals did not touch upon them, but had reference to the details of the execution, organization, the form of the interrogatories, the explanations and schedules. The proposals might perhaps go too far, but all was well thought out and carefully formulated for each step in the investigation. This was a great gain for the comprehension of the method. The Congress did not concern itself with theory. It is an exception to the rule when a resolution of 1869 says: The Congress is of the opinion (1) that in all statistical researches it is important to know the number of the observations as well as also the quality or nature of the facts observed; (2) that in a series of large numbers, the qualitative value is to be measured by the divergences of the numbers among themselves as well as from the average of the series; (3) that it is desirable to calculate not only the averages, but also the oscillations, in order to know the average deviation of the numbers of a series from the average of the series. The Congress brought to the members a clear conception of the statistical method, and complete agreement in regard to it. The entire contents of the *Compte-rendu général* (the last St. Petersburg, 1872) bear testimony to this point.

Although the proposals were but partially applicable beyond the land which gave them birth, they furnished, nevertheless, instructive models, and served to spread similar views as to what was possible and useful for certain purposes. Certain ideas on the systematization and improvement of the investigations were accepted as a mat-



ter of course by the large number of statisticians, and were incorporated in the statistics of all countries, even in those but little developed. The proceedings and dignified representative character of the Congress increased the interest for statistics and the understanding of them in the general public. It became easier for the governments to obtain the means, and to demand from the officials and the public things which could not have been thought of earlier. In a brief period the recognition of the scientific character of statistics and the necessary extent and uniformity of its contents has been greatly extended. Everything which has occurred for statistics since the beginning of the Congress has been essentially a consequence of its stimulating and invigorating influence.

## II. MODERN STATISTICAL PRACTICE.

### § 49. INCREASED NEED OF STATISTICS AND STATISTICAL OFFICES.

The effects of the Congress were however based also on the needs of the age.

Since the movements of the year 1848, the constitution and administration of most states had undergone a reorganization on a new basis. The budgets, and the business affairs of the various departments, the "motifs" of the laws, and the discussions of the legislative bodies required and furnished a rich statistical material, usually with annual repetitions. This increased the investigations which had been the subject of general statistics since the introduction of the statistical bureaus.

Numerous private institutions began to feel the need of statistics, and they were soon indispensable. Besides life insurance institutions the railway companies required comprehensive investigations (*Deutsche Eisenbahn Statistik*, yearly since 1849; *Statistische Nachrichten über die preussischen Eisenbahnen*, since 1852, etc.). The same

is true of the credit institutions and the various stock companies required by law to publish statements and reports. Reports from institutions of all kinds, foundations, and societies became general with the increased availability of printing and the newspapers. Thus there accumulated from year to year an enormous mass of material. As soon as printed it could be referred to, often in public life, and hence it could not be ignored by the official statistics.

States which up to this time had possessed no statistical bureaus found it urgent to establish them on the model of the other states. Besides those named in §§ 34-42, statistical bureaus were founded in 1853 in Brunswick, 1858 in Gotha, 1859 in Roumania, 1861 in the Argentine Republic, and in 1862 in Servia. In 1864 a common bureau for some of the Thuringian States (Weimar, Altenburg, Meiningen, the two principalities of Schwarzburg, and the two of Reuss) was established at Jena, and in 1865 bureaus were established in Finland and Anhalt. In 1869 Egypt, 1871 Lübeck and Venezuela, 1872 Alsace and Lorraine, 1874 Turkey, and 1875 Japan founded statistical bureaus. The last named has had for some time highly-developed official statistics.

A number of Central Commissions are also to be mentioned. Beside those already noticed, they had been organized by 1861 in the Electorate of Hesse, Mecklenburg-Schwerin, Wurtemberg, Hesse-Darmstadt, and Oldenburg.

Since 1865 municipal bureaus have been created in increasing number. Before 1870 they had been founded at Berlin, Leipzig, Frankfort-on-the-Main, Breslau, Altona, Dresden, and outside of Germany in Vienna, Buda-Pesth, Riga, Venice, Genoa, Florence, Rome, and Naples. In 1876 municipal bureaus existed further in Chemnitz, Stettin, Münster, Prague, Triest, Brussels, Copenhagen, Milan, Messina, and Palermo.

## § 50. CHARACTER OF STATISTICAL WORK.

The statistical offices assumed at this time in their administration, still more however in their work and the scope of their labors, a uniformity of character which, considering the differences of the nations, was truly surprising.

In their administration the offices had as director a state official directly or indirectly dependent on the Ministry, and according to the extent of the work specialist associates, as well as subordinate officials and assistants for the clerical operations. Requests and directions to be transmitted to government offices were required, as a rule, to pass through the Ministry, except where for special purposes direct intercourse was permitted. The Provincial and municipal bureaus are subject to central authority for such statistics as concern the whole country, but independent for their own particular investigations.

The labors of the bureaus are directed chiefly to the compilation of the numerical material.

Although formerly the idea prevailed of obtaining in the statistical bureaus organs for the supervision or collection of all the statistics of the country, the field of the investigations to which they have devoted themselves has become, on the contrary, comparatively restricted. It includes generally the statistics of population and territory; also agricultural statistics, and in some cases also the statistics of trade and commerce. Apart from this they were generally over-burdened by the collection of archives, the partial publication of the material coming from various quarters, and by the replies required for the numerous questions put to them by the governments.

For all their publications the details of the numbers occupied unconditionally the foreground. To determine with the differences of time and locality the exact results of the investigations, and to preserve them for future comparisons and problems of all kinds by means of the

printing press, must be admitted to be a much more useful and necessary application of time and money than the preparation of essays, criticisms, and calculations, in which one is apt to lose sight of the basis of the work, as the form of presentation will not admit of exhaustive explanations. Besides this, it is to be considered that the criticism of the correctness of this basis, of the method of making returns, of the avoidance and removal of errors by means of more stringent requirements, had become much more strict, and that in consequence the labors of the bureaus had increased accordingly. This was the reason that in the course of time the publications of the statistical institutions were limited almost exclusively to critically sifted and systematically arranged numerical materials, as complete as possible, *i. e.*, essentially to the comprehensive volumes of tables which pour out in such numbers every year from all civilized nations.

The publications consist primarily of materials (Quellenwerke) which give the material detailed in tables, and generally only the most necessary combinations, with the directions and the explanations of the method of investigation; further of Annuals (Jahrbücher), which give short tabular abstracts of the main results; and finally of Periodicals (Zeitschriften), which are open to the essays of private investigators. (The long list of such publications from the various states can be best found, though even here not quite complete, in the "Katalog der Bibliothek des Königlichen Statistischen Bureaus zu Berlin," Vol. I., 1874, II., 1879, and the more recent ones in the "Katalog der Bibliothek des Deutschen Reichstags," 1882.)

If under these conditions the drawing of conclusions as far as it was not required by the actual needs of the government, was mainly left to private persons, scholars, legislators, and others, it could not but follow that the stringency of the method should become an object of the highest interest to the official statistician. The need and the essence of stringent critical requirements revealed them-

selves to all who had to educate a number of subordinates in making uniform observations. It was felt most urgently, it is true, by the central offices, which, like the Statistical Office of the German Empire, were obliged to formulate regulations which should be uniformly understood in numerous and greatly differing states, and which, despite the fact that the freedom in the execution could be limited as little as possible, should nevertheless lead to homogeneous results.

On the basis of this continuous progress and stimulus to the methodical procedure, the official statisticians came into close contact with the statisticians of morals, whose learned researches had led them also to the development of the critical method.

### III. THE STATISTICIANS OF MORALS.

#### § 51. IDEA OF CONSTRAINING REGULARITY.

The more official statistics were limited to the numerical presentation of the ascertained facts, and the more, therefore, a certain dryness in the treatment and the points of view became apparent, the more the statisticians who sought more profound contents, and results which appealed more to the imagination, turned their attention to the subject of social physics, as Quetelet had named it.

Quetelet left no doubt that he was convinced of the presence of laws, capable of proof by calculation, which govern the life and actions of man and society. He drew no further conclusions.

Sir F. W. Herschel, the astronomer (born 1792, died 1871), drew in 1850 the more definite conclusion that the freedom of mankind was hardly perceptible.

H. Thomas Buckle (born 1822, died 1862) declared in his "History of Civilization in England," 1857, quite can-

didly that a necessity based upon natural law must be presupposed in all human actions, and that the dogma of free will must be totally rejected. With this consequential fatalism he hoped to place all historical science on the basis of statistics.

This opinion found at the same time support and opposition in Adolf Wagner's "*Gesetzmässigkeit in den scheinbar willkürlichen Handlungen*," 1864; support in the strict deductions, reaching beyond Quetelet's material, and in the manner of treating large numbers; opposition, however, in the emphatic rejection of every deterministic consequence, not better founded but more distinctly pronounced than by Quetelet.

Other and particularly Italian statisticians adhere with preference to Quetelet's idea of a constraining force of natural law for the masses and freedom for the individual. We cite Messedaglia, *Studii sulla popolazione*, 1866; Corradi, *Hygiene of Italy*; Bodio, *Statistica nei rapporti coll' economia politica*, 1869; E. Morpurgo, *Statistica et le scienze sociali*, 1876 (German, 1877). The last named expresses the general opinion in holding that the individual can choose freely between virtue and vice, but is helpless in face of the laws which govern the masses, and that the knowledge of these laws will enable statisticians to portray the development of the intellectual and moral forces of mankind, and the ethical order of the universe with the same precision as physics explains the mechanism of existence.

## § 52. INCOMPATIBILITY WITH ETHICS AND PSYCHOLOGY.

These ideas conflict with the accepted foundations of ethics and psychology, and would therefore, should they prove correct, lead to a revolution in the essential principles of both sciences. The representatives of the latter have very generally rejected the claims of these ideas.

Some works attack this conception of the statistics of morals from an ethical or psychological standpoint.

M. W. Drobisch, "Die moralische Statistik und die menschliche Willensfreiheit," 1867, accuses Wagner of abandoning the doctrine of free will, and allowing it to appear that the idea of moral responsibility could not be supported.

A. v. Oettingen, "Die Moralstatistik und die christliche Sittenlehre, Versuch einer Sozialethik auf empirischer Grundlage," 1868, pronounces Wagner free from fatalism, but does not approve his deductions. In opposition to Quetelet's social physics, resting on a naturalistic conception of the universe, and also to the common theological personal ethics resting on an atomistic spiritualism, he endeavors to construct a theological system of social ethics. It has for its point of departure that unless mankind can *will*, state and church would be senseless and purposeless, that man cannot be separated entirely from his connection with the human community, and that this constitutes a collective body, which renders it improper for the individual man to be prompted in all his actions solely by egoism.

A. Heuermann, "Die Bedeutung der Statistik für die Ethik," 1876, has maintained that it is ethically valueless to leave merely the small oscillations in the great numbers to the freedom of the will, but to consider the law of the large number as unconditionally operative. The law of causal connection requires that all human actions should be entirely accounted for. It does not exclude freedom, but rather comprehends it, for it demands that every action shall be the comprehensible product of a being, weighing the motives and deciding one way or the other without compulsion.

## § 53. SOLUTION OF THE PROBLEM BY THE STATISTICAL METHOD.

The solution of the problem propounded by the statisticians of morals has been most effectively given by statisticians themselves. The reasons and the statistical necessity for the uniform series of numbers have been convincingly proved to be totally without connection with any compulsion of the free moral decision, or, indeed, with any limitation whatsoever of the will, by natural law.

G. Rümelin, "Ueber den Begriff eines sozialen Gesetzes," 1867 (Reden und Aufsätze, Vol. I.), had already denied that a constraining necessity, either for the individual or for the mass, which could be considered a law, as understood by Buckle, resulted from the numerical relations which the statisticians of morals quote.

G. Schmoller, "Ueber die Resultate der Bevölkerungs- und Moralstatistik," 1871, and G. F. Knapp, "Die neuen Ansichten über Moralstatistik," 1871, have demonstrated more in detail, and quite convincingly, that the regular repetition of equally large effects proves nothing more than the continuous existence of equally strong causes, whether they be internal or external. And further, they show that this regularity which is explained so easily and radically by the assumption of natural laws, is by no means so constant as the effect of physical law. The regularity is different for every group of phenomena, so that we must have for each group a particular law, and for the whole so intricate a complex of laws that the result has a remarkable similarity with that which follows when we consider mankind as acting according to inner motives. It is in fact a most remarkable predetermined harmony, that external law should lead men to steal wood when cold prevails, and bread when times are hard. Therefore, a constancy of certain phenomena of moral statistics must be considered better than variations, for it signifies a tri-



umph of the moral decision of the will over tempting sensual desires, a triumph of mind over matter.

Chr. Sigwart in "Logik" (1878, Vol. II. p. 528) declares further: the regularly recurring figures express nothing more than that the effects which show that the causes present in individual cases, for a portion of the community, are equally distributed in time. This result of an equal distribution in time would be most expected when a great number of causes operating independently, variably, and according to the most diverse laws, are brought to bear upon a mass of objects, uniform in number and composition. It is just the accidental nature which causes us to expect the equal distribution, and we should seek rather a special cause in perceiving an accumulation of such events. The regularity of the numbers permits a conclusion that the conditions are constant.

All these considerations as to the nature of the regular phenomena of the statistics of morals, which place the question in the proper scientific light, presuppose a correspondingly profound penetration into the comprehension of the statistical method.

#### IV. CONCEPTIONS OF STATISTICAL THEORY.

##### § 54. OPPOSING POSITIONS.

The question of statistical theory is closely allied to that of the essence of statistics as a science, that of its sphere as a portion of human knowledge, and that of its specific contents whereby the limits of this knowledge are extended. These fundamental ideas, which either helpfully or misleadingly influence the theory, have been seldom, however, discussed in connection. But few specifically theoretical treatises of a comprehensive character can be mentioned. The conception of each statistician appears most clearly in his definition of the subject. Most of them, however, simply pronounce such a definition as an

introduction to the subject, with scarcely an endeavor to make the definition the fundamental idea and crowning point of a detailed system.

In these definitions we find essentially the old opposing views of the statistics of the state and those of population. The idea of a distinct method of investigation is a new feature which begins to make itself felt in the discussion.

Every scientific treatment must either place in the foreground the object or else attach itself to the method of the investigation. In the first instance no mode of investigation may be neglected in order to gain a systematic knowledge of the object. If the state is to be the subject of the science, it would obviously be a one-sided, arbitrary limitation, to consider it only from the results of enumerations. In the second case the more a particular process is matured, and the more critical its applications the more numerous and diverse are the objects which are accessible to it. There may result such a general connection of the principles that a systematic knowledge of the method will be possible. The opposing opinions of statistical theorists oscillate between these two possibilities.

#### § 55. CONCEPTION IN THE SENSE OF STATISTICS OF THE STATE.

In their adherence to the object simply, without consideration of the method used to obtain their knowledge of it, Achenwall's school were most persistent. To obtain "*Staatskunde, Staatsbesonderheiten, and Staatenvergleichungen*" (political descriptions, phenomena, and comparisons of states) in such a form as should exhaust as far as possible everything worth knowing was Achenwall's aim. The method by which this information should be gained was of little consequence. The so-called theoretical essays of the school treat rarely of anything beyond the manner of grouping facts and a few principles for comparisons.

One can no longer speak of a school of Achenwall, yet

there are quite a number of statisticians who in theory remain true to its traditions.

J. E. Wappäus (born 1812, died 1879) in "Bevölkerungsstatistik," 1859, and Robert v. Mohl (born 1799, died 1875), in "Geschichte und Literatur der Staatswissenschaften" (1858, Vol. III. p. 647), express the same opinion that if statistics is not to lose its character as a science, it must adhere in essence to the definition of Achenwall, that it is by no means limited to such facts and conditions as can be expressed in numbers, but must rather reflect in an exhaustive manner all actual and social conditions of the population.

Lorenz v. Stein, "System der Staatswissenschaften" (1852, Vol. I. p. 83), finds Schlözer's definition appropriate: "Statistics is stationary history."

Also A. Gaillard, "Éléments de statistique humaine ou démographie comparée" (1855); Jonák, "Theorie der Statistik" (1856); and, similarly, Zuccagni-Orlandini, Iginio, Zambetti, and Nardi consider the physical, economic, political, and moral conditions of the state as the subject of the data and research of statistics.

The underlying ideas of the Austrian "Prüfungs reglement" of July 29, 1850, and the rescript appointing the Prussian Central Commission of July 9, 1860, correspond also to this point of view.

Further, it cannot be overlooked that though the International Statistical Congress was thoroughly convinced that statistical information is entirely dependent on methodical, exact, numerical investigations, yet, nevertheless, that its whole system coincided very closely with Achenwall's statistics, and that it gave support to the idea that an examination of the life of states and peoples, and a comparative description of states, were to be understood as statistics. Indeed, the Congress says expressly in the Report of 1853, "without doubt statistics operates with numbers, numbers are its chief element, but they are not

the only one, statistics is also 'la science raisonnée des faits.'"

Finally, this conception finds support in a great number of literary works, which, as W. Roscher, in "Geschichte der Nationalökonomie in Deutschland" (1874, p. 1011), expressly says, cannot properly be classed elsewhere than under statistics. He mentions: Wappäus, *Amerika* (1855); v. Viebahn, *Zollvereintes Deutschland* (1858); Bavaria (1860); Meitzen, *Der Boden des Preussischen Staates* (1868). He could have added "Das Königreich Württemberg" (1863); Wirth, *Schweiz* (1871); Ratzel, *Vereinigte Staaten* (1878); "Das Grossherzogthum Baden" (1885), and others. His reference to W. Riehl's "Naturgeschichte des Volkes" shows, on the other hand, the obvious necessity of separating from statistics the description of countries as an independent scientific department.

#### § 56. CONCEPTION AS SCIENCE OF HUMAN COMMUNITIES.

Though the metaphysical flights of the statisticians of morals must be considered as too ambitious, and their explanation of facts as a deviation from true principles of science, yet a large number of professional statisticians adhere to the same field of research as the essential one of their science. That is to say, the penetration into the condition and changes of the social life of mankind, the observation of the so-called human communities (*Gemeinschaften*) appears to them as the scientific object of statistics. What Quetelet and his followers looked upon as constraining laws, this more realistic school in statistics regards as a sphere of regularities which lead to the discovery and explanation of similar conditions and causes. Two decades after Moreau de Jonnés (§ 46) this idea became very general.

F. B. W. v. Hermann (§ 34) (*Die Bewegung der Bevölkerung in Bayern*, 1863) says: Everything in the activity of the state and the life of the people which can be reduced

to size and number, and be quantitatively compared, becomes the object of statistics.

Bruno Hildebrand, in the essay "Die wissenschaftliche Aufgaben der Statistik" (*Jahrbuch für Nationalökonomie und Statistik*, Vol. I., 1866) writes: Statistics notes all similar actions and experiences of men in a given space, and calculates the relation of the total of these phenomena to the total number of men, or of actions and experiences, in the same time and locality, and thus finds relative numbers which express as unimpeachable general facts the rules which govern the occurrence of the individual actions and experiences.

A. Frantz (*Handbuch der Statistik*, 1864), Rameri (1869), de Luca, and Racioppi agree with this conception. W. Lexis (*Theorie der Massenerscheinungen*, 1877) expresses the same thought as follows: Statistics have the independent problem of considering and investigating according to exact methods the characteristic collective phenomena of human life which are accessible to scientific observation. The enumeration of all individual cases of the phenomenon forms the basis of its method.

G. Mayr (*Gesetzmässigkeit im Gesellschaftsleben*, 1877, p. 13) distinguishes between the statistical method and the narrower sphere of statistics as an independent science. The application of the statistical method is not confined to the life of society, but is used also in the observation and study of purely natural facts. But the observation of the purely natural facts which have no connection whatever with the social life of mankind, must be excluded from the sphere of the independent science of statistics. He defines statistical science as the systematic presentation and exposition of the actual occurrences of social life and the laws resulting therefrom, upon the basis of the quantitative observation of aggregates.

Quite in accord with these views are M. Block (*Traité théorique et pratique de statistique*, 1878, 1886) and Th. v. Inama-Sternegg (*Statistische Monatshefte*, Wien, 1882).

E. Engel (§ 34), to whom particular merit in the formation of the theory and practice of statistics is justly accorded, declares statistics to be a science, to which he gives the name of demology or the science of human communities. Its aim is to observe in its phenomena the physical, intellectual, and moral life of the peoples of organized states, to formulate its observations arithmetically, and to demonstrate, as it were, by analysis the connection of cause and effect in these phenomena. Its field of observation is not individuals but aggregates united and grouped into communities, on the one hand, of families, clans, tribes, nations, and peoples, and, on the other, in classes of rank, wealth, occupation, faith, and so forth. It becomes the physics and physiology of society, and forms, as it were, a link between the social and natural sciences. Besides the physiological, positive, comparative, and pragmatic demology, which he further divides according to particular modes of treatment, he considers also practical demology or the method of statistics, which includes its methods and resources, its applications, its workshops, its aims, and its achievements.

Upon this conception of the scientific sphere of statistics a great number of acute, penetrating works on method have appeared, which though they treat only of special phases of the statistics of population, are capable, nevertheless, of casting a bright light on every kind of statistical investigation.

E. Engel, *Methode der Volkszählungen*, 1861; Fabricius, *Zur Theorie und Praxis der Volkszählungen*, 1868; M. M. v. Baumhauer, *Bevolking in 1863* (*Statistisch Jaarboek v. h. koningrijk der Nederlanden*, Vol. 14, Part I., 1867). Wittstein, *Mathematische Statistik in ihrer Anwendung*, 1867; Zeuner, *Abhandlungen aus der mathematischen Statistik*, 1869; G. F. Knapp, *Ueber die Ermittlung der Sterblichkeit*, 1868, and *Theorie des Bevölkerungswechsels*, 1874; K. Becker, *Zur Berechnung von Sterbetafeln*, 1874, and *Bericht von July 10, 1874* (*Statistik des*

Deutschen Reiches, Vol. XX., I., p. 145); R. Boeckh, Sterblichkeitstafel für den preussischen Staat, im Umfange von 1865, 1875; W. Lexis, Einleitung in die Theorie der Bevölkerungsstatistik, 1875, and Theorie der Massenerscheinungen in der menschlichen Gesellschaft, 1877.

#### § 57. CONCEPTION OF STATISTICS AS A SCIENCE OF METHOD.

Opposed to this numerous list of statisticians who regard the distinctively numerical method proper for statistical practice, but find the theoretical essence of statistics in the idea that it has for its subjects the life of states and peoples, or of human communities, there is another group of statisticians who consider this object, the life of mankind, to be, though prominent, merely accidental, the result of circumstances, or not exclusive of other things, and who on the contrary find the scientific character of statistics in the method itself. This view was pronounced by Potlock and Cournot (§ 46).

Rümelin (Zur Theorie der Statistik, Tübinger Zeitschrift, 1863) treats it with great penetration. He sees in statistics proper a methodical auxiliary science, which he compares to other auxiliary sciences, which, like philosophical critique and hermeneutics, consist merely in the exercise of formal and methodical processes. His conception is based on the nature of the phenomena capable of enumeration, in their relation to those numerically fixed or typical. In nature, as he says, the individual is typical, hence a single accurately ascertained fact justifies an induction. Logic puts together only the constant qualities as making up the idea, but cannot turn to account scientifically that, which in one case occurs so, in another differently, in a word, the variable factors. The statistical method enters in the empirical sciences just at the point where induction, the conclusion from the single typical case to other cases, is not available. Briefly, the statistical procedure may be

called the methodical observation of aggregates. It consists in spreading, as it were, a network of observations over entire groups of individuals, in order to observe and register by a single method all phenomena of the same class. This method of observation dissolves the collective ideas of race, church, district, rank, and others into the individuals which compose them, in order to observe for each individual whether in his case a certain phenomena occurs or not. It is, therefore, clear that it is always concerned with an enumeration, and that the number is typical of this method of observation. The more numerous the objects of such observation, the more extended the single groups, and the more numerous the groups subjected to the same observation the more complete and thorough does the characterization of the collective idea become, and the richer becomes the material for inductive reasoning and for the knowledge of the interdependence of human phenomena. Thus a way is obtained to characterize correctly collective ideas.

Adolf Wagner (§ 51. Article Statistik in Bluntschli und Brater, Staatswörterbuch, 1867) characterizes the general idea of statistics as the methodical inductive procedure for the solution and explanation of the mechanism of humanity and nature, of the real world generally, *i. e.*, for the derivation and explanation of the laws according to which the mechanism acts, and for the discovery and explanation of the causal connection between the individual human and natural phenomena, by means of a system of methodical observations of the aggregates of these phenomena, leading to a determination of their quantitative relations.

M. Haushofer (Lehr- und Handbuch der Statistik, 1872) designates statistics as an essentially methodical science. He says statistics is a method and a science. Conceived as systematic investigation of aggregates it is a method. To be a science there must be beyond the unity of the method a certain unity of the object. This object is the aggregate of phenomena as such. Statistics is, therefore,



the science of aggregate, and in particular of the aggregate of human and political phenomena, of their movement, and its laws. Statistics is for him, nevertheless, merely an auxiliary science. It seeks and finds truth, but only such truth as is utilized by other sciences. Its character as method is therefore predominant.

The idea that the scientific essence of statistics was not to be sought in a specific object, but in the manner according to which any object in its multiplicity is investigated, is found accordingly in certain works which treat of special problems as examples of methodical procedure: G. Mayr, *Ueber die Grenzen der Vergleichbarkeit statistischer Daten*, 1866; and *Ueber die Anwendung der graphischen Methode*, 1877; *Die Aerzte und das medizinische Hülspersonal (Statistik des Deutschen Reiches, Vol. XXV., 1877)*; G. Tammeo, *Le medie et loro limiti*, 1878; Marey, *La methode graphique dans les sciences expérimentales*, 1879; Perozzo, on the graphical representation of successive entireties with three coördinates (*Annali di statistica, Ser. II., Vol. XIV., 1880*).

The application of the statistical method to phenomena which are totally distinct from, or else only remotely connected with, political and social life, or, as it has been called, "demography," has done much to confirm the view of the scientific character of statistics which we are considering.

Meteorology, particularly from the standpoint of telluric and cosmic physics, exceeds in the precision of the statistical observations and conclusions every other field of statistics. Botany and zoölogy have besides the history also statistics of their living and fossil genera and species. Astronomy has based upon the consequences of Herschel's system exact statistics of the stars in their order of magnitude. Medicine applies the statistical method in the broadest sense for the comparative judgment of the phenomena of sickness and health. Even philology has profited

from the statistical treatment of the recurrence of words and sounds.

M. Block (§ 56) declared as early as 1860 (*Statistique de la France*) all such applications of the method to be statistics. Rümelin wrote, 1874: "The statistical method takes hold everywhere, where it finds variable factors in the phenomena brought under its observation. And these exist everywhere and in all the realms of nature. Some interest may attach itself in every case to these variable elements. It could possibly be deemed worth while to sort grains of sand according to size and count them." (This actually takes place with great accuracy in recent investigations of soils.) "It is at present not to be foreseen what significance the method may attain in the various fields of natural science. Up to the present moment it finds extensive and steadily increasing employment in a number of them, in meteorology, in physiology, and in medicine."

#### § 58. CONCEPTION OF STATISTICS AS APPLIED LOGIC.

From the recognition of the idea that the scientific character of statistics was its peculiar method, irrespective of the object to which it might be applied, it was an easy step to the conception of the method as a branch of logic, as an extension of the logical mental processes, and with a certain scientific independence.

A similar general character has been ascribed to statistics by John Stuart Mill in his "System of deductive and inductive logic," 1843. He treats of the methods of probabilities and of comparison in the same spirit. Caporale also said in his *Lezioni*, 1863, "statistics is logic, numerical analysis, and synthesis of facts, presented in tables for definite useful purposes."

Christoph Sigwart in "Logik" (Vol. I., 1873, II., 1878) gives the subject the first exhaustive treatment. He begins with the proposition that the general purposes of thought

demand of human perception that it should describe objectively, exhaustively, and accurately the single things and occurrences which present themselves, and class them according to time and species. This completeness of human perception in time and space could, as he says, be represented only by a description of the world, comprising all perceptible things in their order of time and space, a species of universal catalogue of all single objects and their changes. Uranography and geography are already far advanced in the discovery of things and their designation with proper names. As far as such completeness of description is not possible it is supplemented by the statistical enumeration of similar things and occurrences under the assumption of an existing classification of the objects. As far as the classification of form and matter proceeds according to perceptible qualities, every description of a single object serves to include it among the classes already formed, or else to extend the sphere of the latter. Thus it is discovered what single objects belong to one and the same class, and this leads to ascertaining how many similar objects exist, in short, to their enumeration. In this enumeration the individual thing is lost—it becomes one of a group of similar units. The common designation of this species of cataloguing by rubrics the number of single objects included under a general idea, is statistical returns or tables. The main characteristic of statistical returns consists in the fact that the single objects are not enumerated and catalogued as such, but that they furnish totals of similar objects and phenomena, thus summarizing the individual perceptions in distinct rubrics. Enumeration has special importance as a means of describing aggregates whose constituent elements are either all similar or else included under a limited number of general ideas. This description or characterization of aggregates is the primary aim of statistics. The next step in the use of the results obtained by enumeration is the presentation of the relations existing

between the numbers in the most easily observed form. It replaces the various totals, which as such afford little insight into the subject, by average values, in order to have a measure of their size, a means of comparison with others. Its purpose is to establish a permanent measure, a rule. The averages show empirical regularities, descriptive in their nature and incapable of expressing a necessity without the aid of the assumption that the occurrences which produce the individual varying instances in a certain field are constant in their totality. A rule can only be assumed when the average of a large field repeats itself uniformly in the smaller fields which go to make up the whole. The statistical conclusion on causality can be based only on the variations and not on the constancy of the numbers. The deviation from the average is an indication that the features distinguishing a part from the whole cause the differences in the number of the phenomena of that part. Statistics show that causes known from other sources have had their effects, that they have not been neutralized by others, and give thus a measure of the intensity of each force in relation to all the others. But it is impossible for statistics to be an expression of a ruling necessity in the single cases enumerated. In as far as we are able to reduce the individual occurrence to actual laws, enumerations of the objects is the only way of obtaining satisfactory information concerning certain phenomena presented to our intelligence. As soon as laws are found, which can only be hoped for by means of analysis and the application of inductive methods, the statistical enumeration ceases to be of interest.